European Commission, Contract 070307/2008/506876/SER/C5
ANALYSIS OF IMPACT OF EFFICIENCY STANDARDS ON
EU GHG EMISSION (ECODESIGN DIRECTIVE)

TASK 3 REPORT:
OUTLOOK ON THE ESTIMATED GHG EMISSIONS REDUCTIONS

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Task 3 Report:

Outlook on the estimated GhG Emissions Reductions

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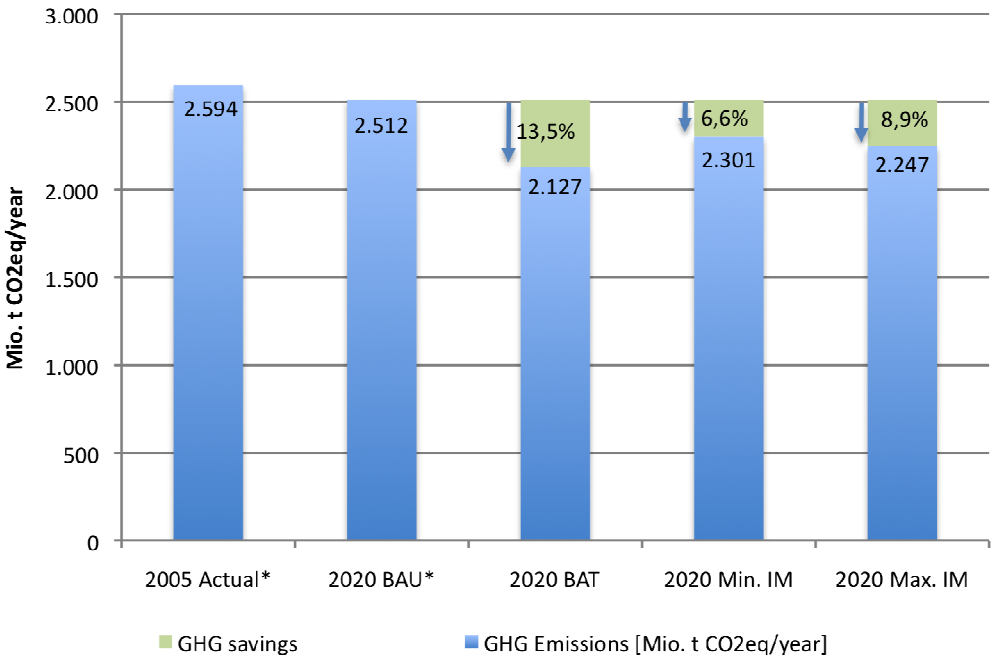
List of abbreviations

BAT	Best available technology
BAU	Business as usual
BW	black and white
CFLs	compact fluorescent light bulbs
CHP	combined heat and power
CH boilers	Central heating boiler
CT	computer tomography
DG ENER	Directorate-General Energy
DG ENTR	Directorate-General Enterprise
ECOS	European Environmental Citizens Organisation for Standardisation
EEA	European Economic Area
EEI	energy efficiency index
EP	Electrophotography
ESD	Directive 2006/32/EC on energy end-use efficiency and energy services (Energy Service Directive)
ETS	emissions trading scheme
EU	European Union
FHG-ISI	Frauenhofer Institute for Systems and Innivation Research
GHG	greenhouse gases
GLS	general lighting service
HD	high definition
HID	high-intensity discharge
HPI	High policy intensity
HPM	High pressure Mercury
IA	Impact Assessment
IJ	Inkjet
LAC	local air cooler
LED	light-emitting diode
LLCC	Least Life Cycle Costs
LPI	Low policy intensity
max.	maximum
MEPS	minimum energy performance standards
MFDs	multifunctional devices
min.	minimum
MRI	Magnetic Resonance Imaging
PAM	policy and measure
RAC	room air conditioner
SD	standard definition
SI	solid ink
SRI	Self-Regulatory Initiative
SSTB	Simple set-top box
UBA	Umweltbundesamt (German Federal Environment Agency)
UPS	uninterruptible power supplies
VHK	Van Holsteijn en Kemna BV

Executive Summary

GHG emissions in 2020 can be reduced by 211 to 265 Mio. t CO2eq compared to business as usual (BAU) development, if effective ecodesign implementing measures are in place. This is a main result of an overall assessment by Wuppertal Institute for Climate, Environment and Energy providing a comprehensive outlook on the estimated GHG emission reductions and energy savings achieved by implementing measures for all those energy-related products that have been already selected within the Ecodesign process in the context of the Directive 2009/125/EC of establishing a framework for the setting of ecodesign requirements for energy-related products (Ecodesign Directive). This result is valid as long as it can be assumed that there will be no compensating price effect in the emissions trading system (ETS), i.e. that the energy end-use savings will not lead to any increase in specific GHG emissions per kWh electricity produced of the electricity generation plants under the ETS cap. The implementation of best available technology (BAT) in the coming years until the year 2020 would even lead to an overall GHG emissions reduction of 385 Mio. t CO2eq. Most of these emissions reductions will be realised in the electricity sector and will allow to set lower caps in the emissions trading scheme.

Figure: Greenhouse gas emissions of product groups selected under the Ecodesign Directive in different scenarios (Status: June 2010)



*PRIMES 2007: TOTAL FINAL ENERGY DEMAND OF PRIVATE HOUSEHOLDS, TERTIARY AND INDUSTRY SECTOR NOT INCLUDING TRANSPORT, BUT INCLUDING ENERGY-INTENSIVE INDUSTRY (COVERING THEREFORE MORE THAN JUST THE ECODESIGN PRODUCT GROUPS)

SOURCE: WUPPERTAL INSTITUTE

The analysis is part of the project “Analysis of impact of efficiency standards on EU GHG emissions (Ecodesign Directive)” carried out by Ökopol GmbH, Hamburg, for DG Environment.

Although energy savings causing these emissions reductions are substantial, with figures from preparatory studies, impact assessments and furthers studies corrected for effects like double counting, rebound effects, different possibilities of market behaviour and the timeframe of implementation, and based on some own modelling by Wuppertal Institute, even with an effective implementation of

ecodesign requirements, electricity consumption will still increase until 2020 compared to 2005, while for heat / fuel consumption the expected decrease will be even steeper.

The investment into energy-efficient products will be beneficial from the user perspective as well as from the societal perspective, leading to substantial energy cost reductions and net cost savings. Energy costs of up to 127 billion Euro can be saved by 2020 compared to BAU development if the maximum of energy savings through implementing measures can be realised and with the strongly increasing energy prices assumed here. With constant energy prices at the 2005 price level, energy cost savings sum up to about 90 billion Euro in 2020 compared to BAU development.

A large share of energy savings, emissions reductions and cost savings is expected to be realised in the field of heating and cooling of buildings. The effectiveness of implementing measures for heating and cooling of buildings will be particularly important for the overall economic impact achieved by implementing measures. Measures in the field of heating, ventilation and air conditioning sum up to about 19% to 28% of total GHG emissions reductions, but up to 60% of total energy cost savings (more than 45% of total energy cost savings assuming constant energy prices at 2005 price level), and heating and cooling measures in the residential sector sum up to about 27% to 38% of GHG emissions reductions and up to 71% of energy cost reductions (more than 57% with constant energy prices at 2005 price level) in this sector.

This overall assessment of impacts of ecodesign policies and measures faces several constraints. First, for several of the product groups selected for the development of implementing measures in the context of the Ecodesign Directive preparatory studies are not finished yet, for some product groups they even have just started yet. Therefore, sufficient data from preparatory studies is not always available, and further sources as well as own modelling by Wuppertal Institute have been used. Second, the data basis and the results from scenario analyses in preparatory studies are not always presented in a transparent and consistent way. In particular, in some studies it is not fully clear on which assumptions the scenario analysis is based. Finally, an aggregation of data from different preparatory studies is difficult, because assumptions like electricity and greenhouse gas emissions factors or energy prices and discount rates differ between preparatory studies, there are overlaps between product groups, and there is a tendency to overestimate existing energy consumption, BAU development and energy savings.

In addition, data generated within the Ecodesign framework is not always comparable with data from the EU study on the Energy Savings Potentials in EU Member States, Candidate Countries and EEA Countries of 2009 by Fraunhofer ISI et al., or data from other studies, because categories of products / fields of application differ from each other.

Facing these and further constraints, the overall results presented here are just a rough estimate. However, for the already regulated product groups, the results presented should be less uncertain, while the assessment for product groups for which preparatory studies have not yet been completed will certainly be a very rough one.

In order to better carry out such kind of overall analysis and to better ensure consistency between the preparatory studies and impact assessments of different product groups, it is strongly recommended to add additional requirements to the methodology, which future preparatory studies and impact analyses of implementing measures should have to follow.

In particular, in addition to the EcoReport spreadsheet and VHK methodology for preparatory studies (VHK 2005), common tables for every product group should be required, which should inform about important assumptions of scenario calculations and about important energy, environmental and economic results of the different scenarios to be calculated.

In order to produce and present comparable results for such tables, there should be a common and transparent way of modelling stock and market and for the scenario calculations. Up to now, several preparatory studies have difficulties in carefully distinguishing between modelling of the market and of the stock. Therefore, the methodology has to be better explained and a stock modelling tool to be provided for future preparatory studies.

Only with such additional requirements, a comprehensive, sufficiently grounded, consistent overall impact assessment will be possible. This is particularly true for the newer, more specific lots, for which there are not so many studies on energy efficiency and further environmental aspects available, which can be used for comparision with results from preparatory studies.

1. Introduction

This task is part of the project “Analysis of impact of efficiency standards on EU GHG emissions (Ecodesign Directive)” carried out by Ökopol GmbH, Hamburg, for DG Environment. The aim of this task is to provide a comprehensive outlook on the estimated GHG emission reductions and energy savings to be achieved by 2020/2030 of all implementing measures proposed for energy-related products selected within the Ecodesign process in the context of the Directive 2009/125/EC of establishing a framework for the setting of ecodesign requirements for energy-related products (Ecodesign Directive). In addition, overall additional costs or benefits of these measures are estimated.

This final draft report takes into account feedback received from different sources to preliminary draft versions of February 2010 and June 2010. Nevertheless, some severe limits to the general task are still visible. In particular, it was not the objective of preparatory studies and impact assessments to develop a new data basis for an overall comparable calculation of impacts but to build on currently available data. However, to a large extent, this data comes from preparatory studies and impact assessments and further documents within the Ecodesign Directive process. However, this data is not always comparable. Within the framework given by the Ecodesign Directive and the respective contracts for preparatory studies and impact assessments, possibilities for contractors of these studies to set specific assumptions and to adapt the general methodology given to the contractors remain. In these studies, assumptions are set up according to the situation and knowledge on the respective product group at the time of carrying out the analysis. Hence, central assumptions and scenario calculations can follow different paths, and thus make it difficult to bring data from different product groups into a common overall assessment scheme.

Consequently, just a very rough estimate has been possible, which is based on product group-specific data from preparatory studies, other studies, impact assessments, a study on energy end-use savings potentials in the context of the Directive 2006/32/EC on energy end-use efficiency and energy services (Energy Service Directive - ESD)(ESD potential study: FHG-ISI et al. 2009) and Wuppertal Institute’s own modelling. This estimate can be partly compared with an older rough overall estimate by the German Federal Environment Agency and with a more recent estimate by European Environmental Citizens Standard Organisation (ECOS) for different implementing measures (with an older ECOS estimate on the product groups already regulated referred to by Wesselink et al. 2010). In addition, recommendations with regard to requirements for data to be presented by future preparatory studies and impact assessments are proposed.

2. Caveats - Limits of analysis

Table 2 shows that not for all product groups quantitative estimates of impacts of implementing measures in terms of energy and emissions savings are currently available (Status: June 2010). These estimates are either from impact assessments, explanations of regulations or draft regulations or implementing measures proposals for the consultation forum.

For the other product groups, for which no such estimates are available, data from preparatory studies combined with data from other studies and own modelling have been used to estimate overall impacts. However, for some of the product groups of the first working plan (ENER 20 - ENER 21, ENV 1) no documents have been available yet, for others (ENER 22 - ENER 27, ENTR 1 - ENTR 2, ENTR 4 and ENTR 6), only first drafts of single tasks of the preparatory studies have been published yet. For the other product groups the preparatory studies are still ongoing and no document was finalised yet. That is why there is only partly data available on these products groups. In addition, for the product groups for which data from preparatory studies have been used, it has to be noted that while some of the scenarios calculated in the respective Task 8 of the preparatory studies seem to be similar to the implementing measures proposed and thus can be taken as an approximation for the possible impact that can be achieved, for other product groups the scenarios are either not similar to implementing measures proposed, or a Task 8 document is not yet available. In particular, there have been several delays in concluding implementing measures compared to the start of implementation calculated in the preparatory study scenarios.

Moreover, within some of the preparatory studies, contradictory data can be found. In particular, data of ENER Task 8 documents sometimes differ from respective data of ENER Task 5 documents. Not only BAT data, but also BAU data differs. This is due to the fact, that for the later tasks of a preparatory study, new data and information is considered which might not have been available when writing Task 5 documents.

It has to be noted, that public data availability for the different product groups differs. For some product groups, published data and information on EU level is rare. Therefore, the preparatory study contractors often strongly rely on data provided by stakeholders. Partly this data is provided confidentially via a notary, and has not been available for this overall assessment. For several product groups, only data for typical products sold in the market on average by few manufacturers has been provided to the preparatory study contractors. In most cases, there is no data available on the distribution of product types within the product group with regard to energy efficiency criteria, just examplary product data declared to be typical.

Table 1: Final energy demand in BAU scenarios for ecodesign product groups (preparatory studies, working documents, impact assessments) and in PRIMES 2007 BAU scenarios

Year	**2005**		**2020**	
Scenario	**Total of figures in Ecodesign documents for product groups covered so far**	**PRIMES 2007***	**Total of figures in Ecodesign documents for product groups covered so far**	**PRIMES 2007***
Fuels / Heat [TWh/year]	4,930	6,466	5,282	5,722
Electricity [TWh/year]	3,526	2,691	4,778	3,447

* FINAL ENERGY DEMAND OF PRIVATE HOUSEHOLDS, TERTIARY AND INDUSTRY SECTOR, NOT INCLUDING TRANSPORT, BUT INCLUDING ENERGY-INTENSIVE INDUSTRY (THEREFORE COVERING MORE THAN JUST ENERGY CONSUMPTION OF ECODESIGN PRODUCT GROUPS)
SOURCE: OWN TABLE BY WUPPERTAL INSTITUTE BASED ON DOCUMENTS WITHIN THE EU ECODESIGN PROCESS AND DG ENER 2008

One example showing that it will not be possible just to take the data from preparatory studies and impact assessments as such for an overall assessment of the impact of the Ecodesign Directive is energy consumption: The sum of electricity consumption stated in the reports for the product groups

for which preparatory studies or even impact assessments have been carried out exceeds the total electricity consumption in the EU-27 for the industry, tertiary and domestic sectors as it can be found in EUROSTAT and different public European energy scenarios. Moreover, the data in the table above (see Table 1) clearly shows that BAU development until 2020 is overestimated in Ecodesign documents, and thus energy savings, too. This is why this study cannot just sum up data from preparatory studies and impact assessments but has to carry out some additional correcting calculations, which focuse on the differences in energy, emissions and cost values between different scenarios (relative values) instead of calculating absolute values, and which correct for aspects like double counting or overestimated BAU and energy saving values in 2020.

Finally, while BAU and BAT data is available for many product groups in documents in the context of the Ecodesign Directive (preparatory studies, working documents, impact assessments), estimated energy consumption and GHG emissions or energy and emissions savings of LLCC cases or scenarios are often not available, although implementing measures should be based on LLCC scenarios.

While in Tasks 4/5, all preparatory studies follow the VHK methodology (VHK 2005) and present similar tables on life cycle impacts per unit of a base case product, for which VHK had provided a respective EcoReport spreadsheet, there is no requirement or spreadsheet template for a unique presentation of energy and emissions data of BAU scenarios and LLCC and BAT cases or scenarios within the VHK methodology.

In addition, data generated within the Ecodesign framework is not always comparable with data from the EU study on the Energy Savings Potentials in EU Member States, Candidate Countries and EEA Countries (FhG-ISI et al. 2009) or data from other studies, because categories of products / fields of application differ from each other.

Finally, systematic country-specific data is usually not available within preparatory studies and impact assessments. Therefore, for the country-specific analysis, own modelling by Wuppertal Institute combined with public European energy scenario data have been applied.

Facing these constraints, the overall results presented in this study are just a rough estimate. However, for the already regulated product groups, the results presented should be less uncertain, while the assessment for product groups for which preparatory studies have not yet been completed is a very rough one.

Table 2: Availability of data on energy savings and GHG emissions reductions for different Ecodesign product groups (Status: June 2010)

		Prep Study ongoing	Prep Study completed	Implementing Measures Proposal (working document)	Self-Regulation or Regulation in force from	**Estimated energy consumption**			**Estimated GHG emissions**		
						Overall with Ecodesign measures*	Per base case LLCC and/or BAT	Overall BAT/BAU/ LLCC of stock	Overall with Ecodesign measures*	Per base case LLCC and/or BAT	Overall BAT/BAU/ LLCC of stock
ENER LOT 0 Simple Set Top Boxes			X	X	25/02/2010	X	Only BAT	Only BAT	X	Only BAT	
ENER LOT 1 Boilers and Combiboilers			X	X			X	BAT/BAU/LLCC totals			Only BAT (totals)
ENER LOT 2 Water Heaters			X	X			X	BAT/BAU/LLCC totals			Only BAT (totals)
ENER LOT 3 Computer and Monitors			X	X			Only BAT				
ENER LOT 4 Imaging Equipment			X	X				Only BAT/BAU			
ENER LOT 5 Consumer Electronics: TV			X	X	12/08/2009	X	Only BAT	Only BAT till 2015	X	Only BAT	
ENER LOT 6 Standby and Off-mode Losses			X	X	07/01/2009	X		Only LLCC and BAT 2020 (totals)	X		
ENER LOT 7 External Power Supplies and Battery Chargers			X	X	27/04/2009	X	Only BAT	Only BAU/BAT (totals)	X	Only BAT	Only BAU/BAT (totals)
ENER LOT 8 Office Lighting			X	X	13/04/2009	X		Only BAU/BAT (totals 2005 and 2020)	X		Only BAU/BAT (totals 2005 and 2020)
ENER LOT 9 Street Lighting			X					Only BAU/BAT (totals)			Only BAU/BAT (totals)
ENER LOT 10	Comfort Fans		X	X				Only BAU/BAT (totals)			Only BAU/BAT (totals)
	Residential Ventilation		X	X				Only BAU/BAT (totals)			Only BAU/BAT (totals)
	Room air conditioners		Draft	X			Only LLCC	Only BAU/BAT (totals)			Only BAU/BAT (totals)
ENER LOT 11	Electric Motors		X	X	12/08/2009	X	Only BAT	Only BAT (totals)	X	Only BAT	
	Fans		X	X				Only BAT			
	Circulators		X	X	12/08/2009	X		Only BAT	X		
	Pumps		X	X				Only BAT/BAU (totals)			
ENER LOT 12 Commercial refrigerators and freezers			X	X			Only BAT	Only BAT/BAU		Only BAT	Only BAT/BAU
ENER LOT 13 Domestic refrigerators and freezers			X	X	12/08/09	X		Only BAT (totals)	X		
ENER LOT 14	washing machines		X	X		X	X	Only BAT	X	X	
	dishwashers		X	X		X	X	Only BAT	X	X	

		Prep study ongoing	Prep Study completed	Implementing Measures Proposal (working document)	Self-Regulation or Regulation in force from	Estimated energy consumption			Estimated GHG emissions		
						Overall with Ecodesign measures*	Per base case LLCC and/or BAT	Overall BAT/BAU/ LLCC of stock	Overall with Ecodesign measures*	Per base case LLCC and/or BAT	Overall BAT/BAU/ LLCC of stock
ENER LOT 15 Solid fuel small combustion installations		Only task 1-7 available (draft)					Only BAT				Only BAT (totals)
ENER LOT 16 Laundry dryers			X					Only BAT (2005)			Only BAT (2005)
ENER LOT 17 Vacuum cleaner			X					Only BAT (totals)			
ENER LOT 18 Complex Set-Top boxes			X	X			Only BAT	Only BAT/BAU (totals)			Only BAT/BAU (totals)
ENER LOT 19	Part I Non directional household lamps		X	X	19/09/09 (Final amendment entered into force, with retroactive effect from 01/09/09)	X		Only BAT/BAU	X		Only BAU (totals)
	Part II Directional light sources		X			X		Only BAT/BAU (totals)	X		Only BAT/BAU (totals 2020)
ENER Lot 20 Local room heating products											
ENER Lot 21 Central heating products using hot air to distribute heat (other than CHP)											
ENER Lot 22 Domestic and commercial ovens (electric, gas, microwave), including when incorporate in cookers		Only Task 1 available (draft)									
ENER Lot 23 Domestic and commercial hobs and grills, including when incorporated in cookers		Only Task 1 available (draft)						Only BAU **			
ENER Lot 24	dish washers	Only Task 1 -4 available (draft)									
	washing machines, dryers and dryers	Only Task 1 available (draft									
ENER Lot 25 Non-tertiary coffee machines		Only Task 1 available (draft)						Only BAU **			

	Prep study ongoing	Prep Study completed	Implementing Measures Proposal (working document)	Self-Regulation or Regulation in force from	**Estimated energy consumption**			**Estimated GHG emissions**		
					Overall with Ecodesign measures*	Per base case LLCC and/or BAT	Overall BAT/BAU/ LLCC of stock	Overall with Ecodesign measures*	Per base case LLCC and/or BAT	Overall BAT/BAU/ LLCC of stock
ENER Lot 26 Networked standby losses of energy using products	Only Task 1-3 available (draft)									
ENER Lot 27 Domestic uninterruptible power supplies (UPS)										
ENTR Lot 1 Refrigerating and freezing equipment	Only Task 1-5 available (draft)						Only BAU **			
ENTR Lot 2 Transformers	Only Task 1-6 available (draft)						Only BAU			Only BAU
ENTR Lot 3 Sound and imaging equipment	Drafts of all tasks available						Only BAU and BAT			
ENTR Lot 4 Industrial and laboratory furnaces and ovens	Only Task 1-3 available (draft)						Only BAU **			
ENTR Lot 5 Machine tools			Draft Self-regulatory initiative							
ENTR Lot 6 Air conditioning and ventilation systems	Only Task 1-3 available (draft)						BAU and potentials are mentioned			BAU and potentials are mentioned
ENTR Lot ## Medical imaging equipment			Draft Self-regulatory initiative				BAU and potentials are mentioned			BAU and potentials are mentioned
ENV Lot 1 Water Using Products										

SOURCE: OWN TABLE BY WUPPERTAL INSTITUTE BASED ON INFORMATION FROM THE ECODESIGN PROCESS

3. Existing overall estimates of (net) energy savings and GHG emissions reductions

3.1. German Federal Environment Agency 2009

Nevertheless, in spite of these limitations, the German Federal Environment Agency (UBA) published first results of an overall assessments of the energy and GHG emissions reduction impacts of the implementing measures of the Energy related Products Directive already in mid 2009 (UBA 2009).

Table 3 shows these achievable saving potentials for those specific product groups for which preparatory studies had already been completed by April 2009.

For implementing measures, which were already adopted by the Commission or the regulatory committee, the expected savings are indicated in the right part of the table. For product groups for which the regulation is not available till now, there are only policy scenarios and therefore calculated saving potentials mentioned by the preparatory studies. Thereby the table points out the maximum (max.) and minimum (min.) achievable energy savings.

Because the implementing measures sometimes include a smaller or larger scope as covered by the preparatory study, there are sometimes considerable differences in the indicated saving potentials (e.g. motors).

The CO_2 savings for electricity saving measures are calculated by applying the factor of 0.430 million tons CO_2/TWh electricity. This factor was used by the working document on possible ecodesign and energy labelling requirements for room air conditioning appliances, local air coolers and comfort fans, published in May 2009.

The table illustrates that the proposed requirements for boilers and water heaters can play a central role within the ecodesign process because these two product groups can contribute the largest part of energy savings of all product groups. With special measures, boilers and water heaters within the European Union can reduce up to 38% of their energy consumption until 2020 compared to 2005, i. e. up to 33% reduction compared to BAU development in 2020. The savings sum up to 677 TWh primary energy and 258 million tons of CO_2 equivalents compared to BAU in 2020 according to UBA.

Besides these two product groups in the heat market, other energy using products can also achieve significant energy savings. According to UBA (2009), based on data from preparatory studies, electricity savings of 103 up to 431 TWh depending on the different scenarios can be attained in 2020 compared to BAU development by Ecodesign Directive implementing measures for 20 electricity-using product groups analysed. Thereby 431 TWh comply with 16% of the final electricity consumption in the BAU scenario for 2020.

However, compared to the starting point in 2005, there will only be minor or no absolute net electricity savings for some product groups because of an increase in the number or size of products used that will use up the savings again. In total, based on the preparatory study data available, UBA (2009) concludes, that net electricity savings for these 20 product groups in 2020 compared to 2005 will be negative, i. e. that there will be an increase in electricity consumption of +8% to +24% compared to 2005 for the sum of these product groups. However, without the implementing measures, the increase would be even +29%.

Table 3: Energy consumption, energy and GHG emissions savings for product groups with already completed preparatory studies (Status: April 2009)

Product	Preparatory Study						Implementing measures concluded					
	Current status/trend TWh		Impact of implementing measure TWh		Impact of implementing measure TWh		Current status/trend TWh		Impact of implement-ing measure		Impact ofimplement-ing measure	
									TWh	Mt CO2	TWh	Mt CO2
	2005	2020	2020 compared to Trend 2020		2020 compared to 2005		2005	2020	2020 compared to Trend		2020 compared to 2005	
	Energy consumption		Energy consumption		Energy consumption		Energy consumption					
			(maximum savings)	(minimum savings)	(maximum savings)	(minimum savings)						
Primary Energy (fuels and electricity; electricity weighted by factor 2.5)												
Boilers and Combiboilers	3035	2586	1794	2138	1794	2138						
			(-792)	(-448)	(-1241)	(-897)						
Water Heaters	1053	1179	729	950	729	950						
			(-450)	(-229)	(-324)	(-103)						
Totals (primary energy)	**4088**	**3765**	**2523**	**3088**	**2523**	**3088**						
			(-1242)	**(-677)**	**(-1565)**	**(-1000)**						
Variation		-8%	-33%	-18%	-38%	-24%						
Final Energy (only electricity)												
Standby and Off-mode Losses	85	104	19	121	19	121	47	49	-35	-15	-33	-14
			(-85)	(+17)	(-66)	(+35)						
Domestic Lighing	122 (2007)	135	49	113	49	113	112 (2007)	135	-39	-17	-16	-7
			(-86)	(-22)	(-63)	(+1)						
Domestic refrigerators and freezers	106	81	74	77	74	77	122	87	-6 (with label)	-3	-41 (with label)	-18
			(-7)	(-4)	(-32)	(-29)						
Circulators	30 (2010)	29	16	28	16	28	55	55	-23	-10	-18	-8
			(-13)	(-1)	(-14)	(-2)						
Commercial refrigerators and freezers	67	93	52	74	52	74						
			(-41)	(-19)	(-15)	(+7)						
Domestic washing machines and dishwashers	48	44	43		43		35	38	-1.5 (with label)	-1	1.5 (with label)	1
			(-1)		(-5)							
Street Lighting	35	39	27	35	37	35	200	260	-38	-16	22,00	9
Office Lighting	27	39	(-12)	-4	(-8)	(+/-0)						
Imaging Equipment	8	9	6	14	6	14						
			(-3)	(+5)	(-2)	(+6)						
Complex Set-Top Boxes	6 (2007)	11	4	8	4	8						
			(-7)	(-3)	(-2)	(+2)						
Simple Set-Top Boxes	6 (2010)	14 (in 2014)	6		6		6 (2010)	14 (2014)	-9 (2014)	-4	-1 (2014)	0
			(-8)		(+/-0)							
Computers and Monitors	67	87	68	73	68	73						
			(-19)	(-14)	(+1)	(+6)						
Residential ventilation	8	11	10	11	10	100						
			(-1)	(+/-0)	(+2)	(+3)						
External Power Supplies	19	39	23	31	23	31	17	31	-9	-4	5	2
			(-16)	(-8)	(+4)	(+12)						
Dishwashers	30	35	34		34							
			(-1)		(+4)							
Consumer Electronics: TV	54	116	70	103	70	103	60 (2007)	132	-43 (with label)	-18	29 (with label)	12
			(-46)	(-13)	(+16)	(+49)						
Pumps	137 (2007)	166	160	163	160	163						
			(-6)	(-3)	(+23)	(+26)						
Room air conditioners	58	156	112	138	112	138						
			(-44)	(-18)	(+54)	(+80)						
Fans	252	345	341	342	341	342						
			(-4)	(-3)	(+89)	(+80)						
Electric Motors	922	1119	1100	1105	1100	1105	1067	1252	-135	-58	50	22
			(-19)	(-14)	(+178)	(+183)						
Totals (electricity)	**2077**	**2672**	**2241**	**2569**	**2241**	**2569**	**1716**	**2053**				
			(-431)	**(-103)**	**(+164)**	**(+492)**			**-339**	**-77**	**-2**	**-1**
Variation		+29%	-16%	-4%	+8%	+24%		+20%	-16%		0%	
Sum of all product groups (primary energy fuels and electricity; electricity weighted with factor 2.5)												
	4088	3765	2523	3088	2523	3088						
			(-1242)	(-677)	(-1565)	(-1000)						
Weighted with the factor 2.5	5193	6680	5603	6423	5603	6423						
			(-1078)	(-258)	(+410)	(+1230)						
Totals (primary energy TWh)	**9281**	**10445**	**8126**	**9511**	**8126**	**9511**						
			(-2320)	**(-935)**	**(-1155)**	**(+230)**						
Totals (primary energy PJ)	**33410**	**37602**	**29252**	**34238**	**29252**	**34238**						
			(-8350)	**(-3364)**	**(-4158)**	**(+828)**						
Variation		+13%	-22%	-9%	-12%	+2%						

SOURCE: UBA 2009

For example, the equipment of computers will continue to grow during the next years. For that reason the resulting absolute electricity consumption of computers in Europe will slightly increase by 2020 by +1% to +6% compared to 2005, although implementing measures will lead to a substantial increase in energy efficiency (-14% to -19% in 2020 electricity consumption compared to 2020 BAU scenario).

Summing up the effects for these 20 electricity-using product groups and for the product groups boilers and water heaters mentioned before, total primary energy consumption of these product groups in the EU will increase from 2005 to 2020 by 13% in BAU scenario, but will be substantially lower if the ecodesign measures will be implemented as proposed in the preparatory studies (-12% to +2% in 2020 compared to 2020 BAU scenario).

For the implementing measures already concluded, UBA (2009) calculates that **implementing measures will stabilise electricity consumption** (-0% change in electricity consumption in 2020 compared to BAU), while there would be an increase in electricity consumption from 2005 to 2020 by 20% in BAU scenario. Or in other words, the implementing measures concluded will lead to a reduction in electricity consumption of 16% in 2020 compared to BAU scenario.

UBA (2009) concludes that the Energy related Products Directive would be an appropriate instrument to increase the efficiency of energy using products, but that **increasing energy efficiency would not be sufficient to achieve necessary environmental and climate protection targets**. Therefore, in order to achieve net absolute reductions in resource use and GHG emissions, additional policy instruments would have to complement the ecodesign implementing measures. In particular, it should not only be talked about increasing energy efficiency, but also the question be raised if all goods were really necessary for a high-quality life.

3.2. ECOS 2010

In Figures 3-20 of their report on the feasibility of binding energy savings targets in the EU, Wesselink et al. (2010) present the expected impact of the nine already adopted implementing measures on energy savings as well as an estimated savings impact for the case that the implementing measures would have been set at top ambition level based on data compiled by the European Environmental Citizens Standard Organisation (ECOS) and confirmed by a study by VHK for the Netherlands.

Table 4: Final electricity (or equivalent) savings and GHG emissions reductions for several Ecodesign product groups

	UNIT	ADOPTED IMPLEMENTING MEASURES	ADOPTED IMPLEMENTING MEASURES + FURTHER PRODUCT GROUPS
ECODESIGN LOTS NO.		ENER 00, ENER 05, ENER 06, ENER 07, ENER 08/09, ENER 11 (electric motors and circulators), ENER 13, ENER 19.1	ENER 00, ENER 01, ENER 02, ENER 03, ENER 04, ENER 05, ENER 06, ENER 07, ENER08/09, ENER10, ENER11 (ventilators and pumps), ENER12, ENER 13, ENER 14, ENER 16, ENER 18, ENER 19.I, ENER 19.II
EU STOCK PERFORMANCE IN 2005 (ENERGY CONSUMPTION AND GHG EMISSIONS)	TWH/YEAR	1,565	3,597
	MIO. T CO2	657	1,689
EU STOCK 2020 WITH BAU ASSUMPTIONS (ENERGY CONSUMPTION AND GHG EMISSIONS)	TWH/YEAR	1,925	4,037
	MIO. T CO2	809	1,866
YEARLY SAVINGS BY 2020 WITH ADOPTED MEASURES			
NET IMPACT COMPARED TO BAU 2020	TWH/YEAR	-337	
	MIO. T CO2	-142	
NET IMPACT COMPARED TO 2005	TWH/YEAR	+23	
	MIO. T CO2	+10	
YEARLY SAVINGS BY 2020 WITH TOP-AMBITIOUS POLICY (ESTIMATE)			
NET IMPACT COMPARED TO BAU 2020	TWH/YEAR	-489	-1,049
	MIO. T CO2	-205	-487
NET IMPACT COMPARED TO 2005	TWH/YEAR	-129	-609
	MIO. T CO2	-54	-311

SOURCE: ECOS 2010 (CF. ALSO WESSELINK ET AL. 2010)

In detail, **ECOS (2010)** estimates GHG emissions and energy consumption reductions presented above in Table 4. Written explanations of these results have not yet been available. However, the figures show:

- According to ECOS, in 2020, summing up the impacts of the regulations already in force, GHG emissions reductions of implementing measures regarding these product groups would have been about **44% higher** with a top-ambitious setting of MEPS at BAT level.

4. Overall estimate of energy savings and GHG emissions reductions, energy cost saving and net cost savings by Wuppertal Institute

4.1 Product groups

The rough estimate of overall energy savings and GHG emissions reductions by ecodesign implementing measures in this study particularly concentrates on the following product groups of the Commission's preliminary working programme (first 19 DG ENER lots), because only for these product groups sufficient data is available (Status: June 2010):

- Standby and off-mode losses
- Simple and complex set top boxes
- Boilers, combiboilers and water heaters as well as solid fuel small combustion installations
- Computers and monitors, imaging equipment
- External power supplies and battery charges
- Consumer electronics: TV
- Office lighting, street lighting, and domestic lighting
- Comfort fans, residential ventilation, room air-conditioners
- Electric motors, fans, circulators, pumps
- Commercial and domestic refrigerators and freezers
- Domestic washing machines and dish washers
- Laundry dryers
- Vacuum cleaners.

In addition, the following product groups of the Commission's working programme 2009-2011 are looked at:

- Local room heating products and central heating products using hot air to distribute air (other than CHP)
- Domestic and commercial ovens (electric, gas, microwave) including when incorporated in cookers; domestic and commercial hobs and grills, including when incorporated in cookers
- Professional wet appliances, dryers and dishwashers
- Non-tertiary coffee machines
- Networked standby losses of energy using products
- Domestic uninterruptible power supplies (UPS)
- Refrigerating and freezing equipment (not yet covered by other lots)
- Distribution and power transformers
- Sound and imaging equipment
- Industrial ovens
- Machine tools
- Tertiary air conditioning

- Medical imaging equipment
- Water using products.

4.2 Data sources

Data sources used for this assessment are:

- preparatory studies
- explanatory notes to working documents
- regulations and respective impact assessments
- data from EUROSTAT and the European PRIMES model, particularly for BAU development of product groups for which no data from preparatory studies has been available (CAPROS et al. 2008; DG ENER 2008)
- the ESD potential study (FHG-ISI et al. 2009). The main focus of this study wass to prepare the analytic basis for an in-depth discussion of economic energy efficiency potentials in the different energy-end uses in the EU-27 in the context of the Energy Service Directive (ESD). Against a "baseline" which considered dynamic autonomous energy savings expected, the study particularly differentiated between
    - energy savings in a low policy intensity (LPI) scenario, i.e. by considering an additional technology diffusion of BAT beyond autonomous diffusion only to a realistic level driven by increases in market energy prices and comparatively low level energy efficiency policy measures as in the past in many EU countries. In this case it is rather likely that consumer decisions will be motivated by cost-effectiveness criteria based on usual market conditions. Barriers to energy efficiency will persist.
    - energy savings in a high policy intensity (HPI) scenario, i.e. by considering that policy reduces transaction costs for consumers by suitable measures, removes barriers and thereby achieves maximum economic energy saving potentials.
    - a technical energy savings potential (TECHNICAL), which assumes the additional technology diffusion of best energy saving technologies to the maximum possible.
- other studies (e.g., BERTOLDI/ATANASIU 2009), and,
- Wuppertal Institute's own stock model data for white goods, TV and lighting developed in the course of several European studies, among others, the ESD study and contributions to the PRIMES model.

The product-specific tables in the Annex to this paper explain the respective sources for energy savings used for the overall assessment.

4.3 Methodology and assumptions

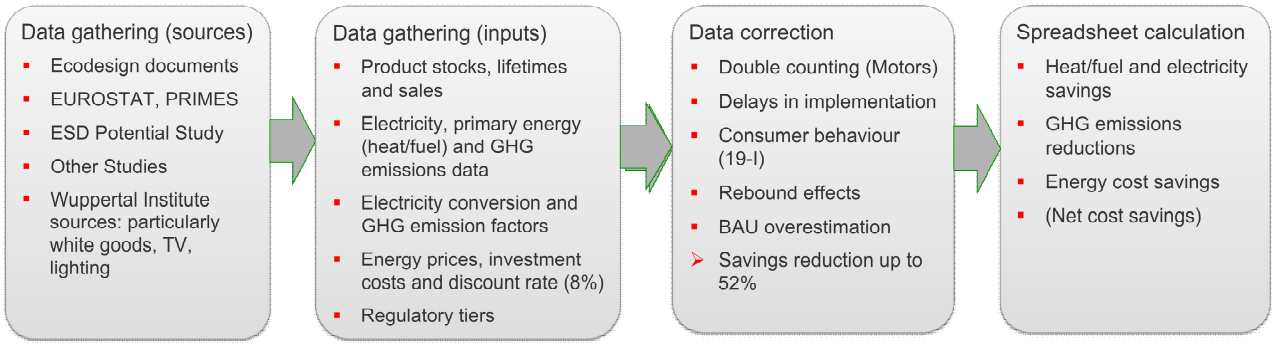
4.3.1 General methodology

First, existing data from the different sources mentioned above has been checked and adopted for the calculations of this task:

- product stock data, replacement rates and sales data
- electricity, primary energy and GHG emissions data
- electricity conversion and emission factors
- prices and discount rates
- tiers of regulation.

A complex spreadsheet has been developed to roughly calculate GHG emissions, energy savings and economic effects based on this data and partly linked to Wuppertal Institute modelling tools particularly in the field of white goods.

Figure 1: General methodology



SOURCE: WUPPERTAL INSTITUTE

This estimate corrects available data from preparatory studies, working documents, regulations and impact assessments in so far as it takes into account the following important aspects:

- Double counting: In particular, for motors, an overlap of 30% with other lots is assumed as it has been roughly estimated in the respective preparatory study, i.e. savings by energy-efficient motors have been reduced by 30%;
- Delays in implementing measures: Several measures will probably start later than calculated in preparatory studies and working documents; the delay expected has been calculated as specific percentages for each product group;
- Behaviour: Consumers will not necessarily buy the most efficient products after a requirement has been in force. For this rough overall assessment, it is just assumed that consumers will buy less CFLs and buy more halogen and LED lamps, which decreases savings compared to existing estimates of about 20%.
- Rebound effects: Rebound effects have been roughly considered (cf. Chapter 4.3.5).

Moreover, for the overall rough estimate it has been taken into account that the sum of estimates for energy consumption development by 2020 for the different product groups in BAU scenarios of preparatory studies, working documents and impact assessments exceeds available estimates from European energy models like, e.g., PRIMES (cf. Chapter 2). Since this overall assessment does not concentrate on such absolute values for these developments but on relative differences between different implementation scenarios, this is not relevant for these calculations if the percentage of change in energy consumption is the same in the ecodesign BAU scenarios and in the PRIMES BAU scenario, which is roughly the case for electricity as it can be shown in the following table. In the end, for the calculations carried out in this overall assessment, all savings estimates have been corrected by a flat rate of 82.72% for heat and fuels, and by 100.07% for electricity, because no differentiated data per product group is available in the PRIMES scenario. How these flat rates have been calculated is explained in the following table.

Any possible changes in the baseline (PRIMES scenario) due to the economic crisis and most recent energy and climate policy have been neglected for the purpose of simplification.

Table 5: Correction for overestimate of savings due to overestimate of BAU development

NO	CALCULATION	HEAT / FUEL	ELECTRICITY
1	TWH FINAL ENERGY 2005 IN BAU: SUM OF DATA FROM PREPARATORY STUDIES / PRIMES DATA	74.39%	130.75%
2	TWH FINAL ENERGY 2020 IN BAU: SUM OF DATA FROM PREPARATORY STUDIES / PRIMES DATA	89.93%	130.65%
3	**NO 1 / NO 2**	**82.72%**	**100.07%**

SOURCE: WUPPERTAL INSTITUTE BASED ON CAPROS, L.; MANTZOS, L.; PAPANDREOU, V.; TASIOS, N. 2008

In total, energy savings from the respective sources have been multiplied by the correction factors summarised in the following table.

Table 6: Correction factors applied to energy savings calculated (rounded)

Product group	Delay		Double counting	Other behaviour	Heat / Fuel overestimated in BAU 2020	Electricity overestimated in BAU 2020	Rebound
SIMPLE SET TOP BOXES	100%	AS CALCULATED IN TASK 8 SCENARIO OF PREP STUDY	100%	100%	83%	100%	80%
BOILERS	75%	ABOUT 3 YEARS AFTER PLANNED IN PREP STUDY	100%	100%	83%	100%	70%
WATER HEATERS	75%	ABOUT 3 YEARS AFTER PLANNED IN PREP STUDY	100%	100%	83%	100%	65%
COMPUTERS AND MONITORS	83%	ABOUT 2 YEARS AFTER PLANNED IN PREP STUDY	100%	100%	83%	100%	80%
IMAGING EQUIPMENT	91%	ABOUT 1 YEAR AFTER PLANNED IN PREP STUDY	100%	100%	83%	100%	80%
CONSUMER ELECTRONICS: TV	100%	AS IN IMPACT ASSESSMENT	100%	100%	83%	100%	80%
STANDBY AND OFF-MODE LOSSES	100%	AS IN IMPACT ASSESSMENT	100%	100%	83%	100%	80%
EXTERNAL POWER SUPPLIES AND BATTERY CHARGES	100%	AS IN IMPACT ASSESSMENT	100%	100%	83%	100%	80%
OFFICE LIGHTING	100%	AS IN IMPACT ASSESSMENT	100%	100%	83%	100%	89%
STREET LIGHTING	100%	AS IN IMPACT ASSESSMENT	100%	100%	83%	100%	89%
COMFORT FANS	91%	ABOUT 1 YEAR AFTER PLANNED IN PREP STUDY	100%	100%	83%	100%	80%
RESIDENTIAL VENTILATION	91%	ABOUT 1 YEAR AFTER PLANNED IN PREP STUDY	100%	100%	83%	100%	80%
ROOM AIR-CONDITIONERS	91%	ABOUT 1 YEAR AFTER PLANNED IN PREP STUDY	100%	100%	83%	100%	65%
ELECTRIC MOTORS	100%	AS IN IMPACT ASSESSMENT	70%	100%	83%	100%	89%
FANS	100%	AS IN WD	100%	100%	83%	100%	89%
CIRCULATORS	100%	AS IN IMPACT ASSESSMENT	100%	100%	83%	100%	80%

Product group	Delay		Double counting	Other behaviour	Heat / Fuel overestimated in BAU 2020	Electricity overestimated in BAU 2020	Rebound
PUMPS	91%	ABOUT 1 YEAR AFTER PLANNED IN PREP STUDY	100%	100%	83%	100%	89%
COMMERCIAL REFRIGERATORS AND FREEZERS	82%	ABOUT 2 YEARS AFTER PLANNED IN PREP STUDY	100%	100%	83%	100%	89%
DOMESTIC REGRIGERATORS AND FREEZERS	100%	AS IN IMPACT ASSESSMENT	100%	100%	83%	100%	90%
DOMESTIC WASHING MACHINES AND DISH WASHERS	91%	ABOUT 1 YEAR AFTER PLANNED IN PREP STUDY	100%	100%	83%	100%	90%
SOLID FUEL SMALL COMBUSTION INSTALLATIONS	100%	AS CALCULATED IN PREP STUDY	100%	100%	83%	100%	70%
LAUNDRY DRYERS	89%	ABOUT 1 YEAR AFTER PLANNED IN PREP STUDY	100%	100%	83%	100%	90%
VACUUM CLEANER	90%	ABOUT 1 YEAR AFTER PLANNED IN PREP STUDY	100%	100%	83%	100%	80%
COMPLEX SET-TOP BOXES	80%	ABOUT 2 YEARS AFTER PLANNED IN PREP STUDY	100%	100%	83%	100%	80%
DOMESTIC LIGHTING PART I	100%	AS IN IMPACT ASSESSMENT	100%	80%	83%	100%	82%
DOMESTIC LIGHTING PART II	91%	ABOUT 1 YEAR AFTER PLANNED IN PREP STUDY	100%	100%	83%	100%	82%
LOCAL ROOM HEATING PRODUCTS	33%	DUE TO LOW NUMBER OF IMPLEMENTATION YEARS UNTIL 2020 AND WITH REGARD TO LIFETIME	100%	100%	83%	100%	70%
CENTRAL HEATING PRODUCTS	33%	DUE TO LOWER NUMBER OF IMPLEMENTATION YEARS UNTIL 2020	100%	100%	83%	100%	70%
DOMESTIC AND COMMERCIAL OVENS	42%	DUE TO LOWER NUMBER OF IMPLEMENTATION YEARS UNTIL 2020	100%	100%	83%	100%	70%
DOMESTIC AND COMMERCIAL HOBS AND GRILLS	42%	DUE TO LOWER NUMBER OF IMPLEMENTATION YEARS UNTIL 2020	100%	100%	83%	100%	70%
PROFESSIONAL WET APPLIANCES AND DRYERS	63%	DUE TO LOWER NUMBER OF IMPLEMENTATION YEARS UNTIL 2020	100%	100%	83%	100%	89%
NON-TERTIARY COFFEE MACHINES	42%	DUE TO LOWER NUMBER OF IMPLEMENTATION YEARS UNTIL 2020	100%	100%	83%	100%	89%
NETWORKED STANDBY LOSSES	100%	DUE TO LOWER NUMBER OF IMPLEMENTATION YEARS UNTIL 2020	100%	100%	83%	100%	89%
REFRIGERATING AND FREEZING EQUIPMENT	50%	DUE TO LOWER NUMBER OF IMPLEMENTATION YEARS UNTIL 2020	100%	100%	83%	100%	89%
DISTRIBUTION AND POWER TRANSFORMERS	14%	DUE TO LOWER NUMBER OF IMPLEMENTATION YEARS UNTIL 2020	100%	100%	83%	100%	89%

Product group	Delay		Double counting	Other behaviour	Heat / Fuel overestimated in BAU 2020	Electricity overestimated in BAU 2020	Rebound
SOUND AND IMAG-ING EQUIPMENT	63%	DUE TO LOWER NUMBER OF IMPLEMENTATION YEARS UNTIL 2020	100%	100%	83%	100%	89%
INDUSTRIAL OVENS	25%	DUE TO LOWER NUMBER OF IMPLEMENTATION YEARS UNTIL 2020	100%	100%	83%	100%	89%
MACHINE TOOLS	42%	DUE TO LOWER NUMBER OF IMPLEMENTATION YEARS UNTIL 2020	100%	100%	83%	100%	89%
TERTIARY AIR CON DITIONING	42%	DUE TO LOWER NUMBER OF IMPLEMENTATION YEARS UNTIL 2020	100%	100%	83%	100%	89%
MEDICAL IMAGING EQUIPMENT	50%	DUE TO LOWER NUMBER OF IMPLEMENTATION YEARS UNTIL 2020	100%	100%	83%	100%	89%

SOURCE: OWN ASSUMPTIONS BY WUPPERTAL INSTITUTE

4.3.2 Electricity conversion and GHG emission factors

It seems that only few preparatory studies explicitly mention the factors applied for the conversion of primary energy into electricity and the GHG emissions factors for the different energy carriers, particularly for electricity. Between those studies, in which the factors are given, the factors partly differ in spite of the common MEEuP methodology given to the preparatory study contractors.

Table 9 gives an overview of the factors identified for the first 19 ENER lots or indirectly taken from analysis of results given in Task 7/8 preparatory study reports.

Often, but not always an electricity conversion factor of about 2.9 or 2.5 has been used in the preparatory studies for 2005. For the purpose of this study, unique conversion factors have been applied for a more consistent assessment. The conversion factors are based on the PRIMES 2008 model and listed in Table 7.

UBA (2009) has used an emission factor of 0.430 million tons CO_2 / TWh electricity for the calculations presented in the previous chapter. This factor was, e g., used in the working document on possible ecodesign and energy labelling requirements for room air conditioning appliances, local air coolers and comfort fans, published in May 2009.

In recent impact assessments, VHK and VMAS have used the following emission factors for electricity (VHK 2009):

- 0.458 kg CO_2eq / kWh electricity for 2005, based on 2001 to 2004 data, and
- 0.384 kg CO_2eq / kWh electricity as average over 2010 to 2020 period, which is the relevant period for projections of impacts of ecodesign implementing measures until 2020.

These factors were based on results of the DG ENER PRIMES model (DG ENER 2008).

In general, the GHG emission factors applied for an overall estimate of GHG emissions reductions by ecodesign implementing measures should consider the following:

- There should be factors not only for electricity since the impacts in the heat and cold market have to be considered, too.
- There should be different factors for the BAU scenarios and for the implementing measures scenarios. Implementing the ecodesign energy efficiency requirements will lead to a substantially different electricity demand in the ecodesign scenarios than in the BAU scenario, which in turn will lead to a different power plant portfolio.

The GHG emission factors applied here in this rough overall estimate are summarised in Table 8. They are factors for an average kWh of electricity produced. In theory, it should be considered that electricity savings help to avoid constructing a new power plant. Therefore, marginal emission factors migth be more suitable. However, there is no commonly accepted way of calculating them, and average emission factors are already commonly accepted in many energy scenario analyses. Moreover, there would be need to differentiate between the different load impacts of the savings for the different product groups. For example, if a kWh of electricity saved just saves base load, emission factors will differ from the case where peak load is saved. Because of these difficulties, average emission factors have been taken.

Table 7: Electricity conversion factors applied for the overall asssessment

YEAR	EFFICIENCY OF GROSS THERMAL POWER GENERGATION [%]	RESULTING FACTOR CONVERTING ELECTRICITY INTO PRIMARY ENERGY
1990	35,6	2,8090
1995	36,6	2,7322
2000	37,6	2,6596
2005	38,6	2,5907
2010	44,2	2,2624
2015	46,0	2,1739
2020	47,8	2,0921
2025	49,6	2,0161
2030	51,2	1,9531

SOURCE: CAPROS, L.; MANTZOS, L.; PAPANDREOU, V.; TASIOS, N. 2008

Table 8: GHG emission factors applied to the overall estimate of GHG emissions savings of Ecodesign Directive implementing measures

	2005	2010 - 2020	SOURCE
POWER GENERATION - TREND	0.465 KG CO2/KWH	0.384 KG CO2/KWH	VHK 2009, DG ENER 2008
POWER GENERATION - EFFICIENCY	0.465 KG CO2/KWH	0.347 KG CO2/KWH	VHK 2009, DG ENER 2008, CAPROS ET AL. 2008
FUELS FOR HEATING AND HOT WATER	0.0577 MT CO2/PJ	0.0577 MT CO2/PJ	LOT 1/2 PREPARATORY STUDIES

SOURCE: CAPROS ET AL. 2008, DG ENER 2008, VHK 2009, LOT 1 AND LOT 2 PREPARATORY STUDIES

Table 9: Electricity conversion and GHG emission factors in preparatory studies and impact assessments

PRODUCT GROUP			CONVERSION FACTOR ELECTRICITY 2005			GHG EMISSION FACTOR CO2EQ ELECTRICITY 2005		
			FACTOR: KWH PRIMARY ENERGY / KWH ELECTRICITY	EXPLICITLY MENTIONED	SOURCE	FACTOR: KG CO2EQ / KWH ELECTRICITY	EXPLICITLY MENTIONED	SOURCE
TREN LOT 0	SIMPLE SET-TOP BOXES		1.7	NO	IMPACT ASSESSMENT, P. 104	0.198	NO	IMPACT ASSESSMENT, P. 104
REN LOT 1	BOILERS AND COMBI-BOILERS		2.5	YES	PREP STUDY, TASK 7, P. 13	MULTI-PLE	YES	PREP STUDY, TASK 7, P. 36
TREN LOT 2	WATER HEATERS		2.5	YES	PREP STUDY, TASK 7, P. 8	0.41	NO	PREP STUDY, TASK 7, P. 28, 42
TREN LOT 3	COMPUTERS AND MONI-TORS		3.98	NO	PREP STUDY, TASK 7,	0.41	NO	PREP STUDY, TASK 7, P. 164
TREN LOT 4	IMAGING EQUIPMENT		4.90	NO	PREP STUDY TASK 8 P. 39			
TREN LOT 5	CONSUMER ELECTRON-ICS: TV							
TREN LOT 6	STANDBY AND OFF-MODE LOSSES		2.91	YES	PREP STUDY, TASK 7, P. 57	0.46	YES	PREP STUDY, TASK 7, P. 57
TREN LOT 7	EXTERNAL POWER SUPPLIES AND BATTERY CHARGERS		3.88	NO	REGULATION, P. 1-2 PRIMARY ENERGY: IA P. 14	0.17	NO	PREP STUDY, TASK 7, P. 41
TREN LOT 8	OFFICE LIGHT-NING	TERTIARY SECTOR LIGHTING						
TREN LOT 10	ROOM AIR CONDI-TIONING APPLI-ANCES	COMFORT FANS	4.69	NO	PREP. STUDY. TASK 8. P. 78. 96	0.24 TO 0.28	NO	PREP STUDY, TASK 7, P. 66 (TOTALS)
		RESIDEN-TIAL VENTI-LATION	4.12	NO	PREP. STUDY. TASK 8. P. 111			
		ROOM AIR CONDI-TIONERS						
TREN LOT 11	ELECTRIC MOTORS	ELECTRIC MOTORS				0.46	NO	IMPACT ASSESSMENT, P. 4
		FANS						
		CIRCULA-TORS			DRAFT IM AND IA (DATA 2010. CO2 2020 AND GER 2020)			
		PUMPS						
TREN LOT 12	COMMERCIAL REFRIG-ERATORS AND FREEZ-ERS					0.51	NO	PREP. STUDY, VIII-55
TREN LOT 13	DOMESTIC REFRIGERA-TORS AND FREEZERS		0.46	NO	IMPLIED FROM IMPACT AS-SESSMENT, P. 3	0.46	NO	REGULATION/IMPACT ASSESSMENT
TREN LOT 14	DOMES-TIC WASHING MA-CHINES AND DISH-WASHERS	WASHING MACHINES				0.53	NO	DRAFT REGULATION
		DISHWASH-ERS				0.52	NO	DRAFT REGULATION
TREN LOT 15	SOLID FUEL SMALL COMBUSTION INSTAL-LATIONS							
TREN LOT 16	LAUNDRY DRYERS		2.98	NO	RAW EST. FROM GRAPHIC, PREP. STUDY, P. 399	0.5	NO	RAW EST. FROM GRAPHIC, PREP. STUDY, P. 399
TREN LOT 17	VACUUM CLEANER		2.98	NO	RAW EST. FROM PREP STUDY, TASK 8, P. 97	0.384	NO	PREP STUDY DRAFT
TREN LOT 18	COMPLEX SET-TOP-BOXES		3.07	NO	RAW EST. FROM GRAPH, PREP STUDY VIII-7	0.49	NO	RAW EST. FROM GRAPH, PREP STUDY VIII-7
TREN LOT 19	DOMES-TIC LIGH-ING	PART I (				0.4	NO	REGULATION
		PART II						

SOURCE: ECODESIGN DOCUMENTS

4.3.3 Discount rates and prices

Table 10: Discount rates, electricity prices, replacement rates and tiers of regulation for every product group worked on (Status: June 2010)

			1	2	3	4	
Lot No.	**Product Group**		**Discount rate [%]**	**Electricity price [Euro/kWh]**	**Replacement rate [%]**	**Tiers**	**Sources (1 - 4)**
ENER 0	**Simple Set-top boxes**		4*	0.153	20	2010 2012	1. Guideline IA COM 2. IA 3. Prep Study (lifetime) 4. Regulation
ENER 1	**Boilers and Combiboilers**		2	0.15	10	2011 2013	1. Prep study Task 5 2. Prep study Task 2 3. Prep study Task 1 4. Prep study Task 7
ENER 2	**Water Heaters**		2	0.15	6.63	2011 2013	1. Prep study Task 5 2. Prep study Task 2 3. Own calculation 4. Prep study Task 7
ENER 3	**Computers and Monitors**		1.8	0.136	15-16	2011 2013 (2012 for displays)	1. Prep study 2. Prep study 3. Prep study 4. Working Document
ENER 4	**Imaging Equipment**		1.8	0.14	18.2 (Printers 1995) 16.3 (Copiers 1995)	2011	1. Prep study Task 5 2. Prep study Task 5 3. Prep Study Task 2 4. Working Document
ENER 5	**Consumer Electronics: TV**		4*/1,8	0.15	11.17	2010 2011 2012	1. Guideline IA COM/Prep study Task 7 2. Based on Eurostat data 3. Prep Study Task 2 4. Regulation
ENER 6	**Standby and Off-mode Losses**		4*/1.8	0.136	12.5	2009 2012	1. Guideline IA COM/ Prep study Task 5 2. IA 3. Prep Study Task 8 4. Regulation
ENER 7	**External Power Supplies and Battery Chargers**		4*	0.136	4-5	2010 2011	1. Guideline IA COM 2. IA 3. Prep Study 4. Regulation
ENER 8	**Office Light-ing**	Tertiary Sector Lighting	4*/1.8	0.136	7-10	2010 2012 2017	1. Guideline IA COM/Prep Study 2. IA 3. Prep Study 4. Regulation
ENER 9	**Street Light-ing**				33 (Category M and S) 29 (Category F)		
ENER 10	**Room air conditioning appliances**	Comfort Fans	2	0.158	10	2012 2015	1. Prep study 2. Prep study 3. Prep Study (Lifetime) 4. Working Document
		Residential Ventilation	2	0.158	10	N/A	1. Prep study 2. Prep study 3. Prep Study (Lifetime)
		Room air conditioners	2	0.158	8.3	N/A	1. Prep study p. 61 2. Prep study p. 62 3. Prep Study (lifetime)
		Electric Motors	**4*/2**	0.136	5-8.3	201120152017	1. Guideline IA COM/ Prep study 2. IA 3. Prep Study (lifetime) 4. Regulation
		Fans	**5**	0.15	6.7	2010 2012 2020	1. Prep study 2. Prep study 3. Prep study 4. Working Document
		Circulators	**4*/2**	0.135	10	2013 2015	1. Guideline IA COM/ Prep study 2. IA 3. Prep Study (lifetime) 4. Regulation
		Pumps	**2**	0.135	9	N/A	1. Prep study 2. Prep study 3. Prep Study (lifetime) 4. Working Document
ENER 12	**Commercial refrigerators and freezers**		1.8	0.097/0.105	10	N/A	1. Prep study 2. Prep study 3. Prep study
ENER 13	**Domestic refrigerators and freezers**		4*/5	0.17	6.7-7.1	2010 2013	1. Guideline IA COM/ Prep study 2. IA 3. Own caculation 4. Regulation
ENER 14	**Domestic washing machines and dishwashers**		5	0.17	6.7	2010 2011 2013	1. Prep study 2. Prep study 3. Prep Study (lifetime) 4. Draft Regulation
ENER 15	**Solid fuel small combustion installations**		1.58	0.16	10	N/A	1. Prep study Task 2 2. Prep Study Task 2 3. Prep Study Task 2
ENER 16	**Laundry Dryers**		N/A	0.1416	7.7	N/A	2. Prep study 3. Prep Study (lifetime)
ENER 17	**Vacuum Cleaner**		5	0.15	12.5	N/A	1. Prep Study Task 2 2. Prep Study Task 2 3. Prep Study (lifetime) 4.
ENER 18	**Complex Set-Top-Boxes**		1.89	0.1528	37.13	2010 2013	1. Prep Study 2. Prep Study 3. Prep Study 4. Working Document

			1	2	3	4	
Lot No.	**Product Group**		**Discount rate [%]**	**Electricity price [Euro/kWh]**	**Replacement rate [%]**	**Tiers**	**Sources (1 - 4)**
ENER 19	**Domestic Lighting**	Part I (non directional household lamps)	4*/1.8	0.137	4-13	2009 2010 2011 2012 2013 2016	1. Prep Study Task 5 2. IA 3. Prep Study (lifetime) 4. Regulation
		Part II (directional light sources)	1.8	0.1529	4-17	N/A	1. Prep Study Task 2 2. Prep Study Task 2 3. Prep Study (lifetime)
ENER 20	**Local room heating products**		N/A	N/A	N/A	N/A	
ENER 21	**Central heating products using hot air to distribute heat**		N/A	N/A	N/A	N/A	
TERN 22	**Domestic and commercial ovens (electric, gas, microwave), including when incorporate in cookers**		N/A	N/A	N/A	N/A	
ENER 23	**Domestic and commercial hobs and grills, including when incorporated in cookers**		N/A	N/A	N/A	N/A	
ENER 24	**Professional washing machines, dryers and dishwashers**		N/A	N/A	N/A	N/A	
ENER 25	**Non-tertiary coffee machines**		N/A	N/A	N/A	N/A	
ENER 26	**Networked standby losses of energy using products**		N/A	0.20	N/A	N/A	2. Prep Study Task 2
ENER 27	**Domestic uninterruptible power supplies (UPS)**		N/A	N/A	N/A	N/A	
ENTR 1	**Refrigerating and freezing equipment**		4*	0,09 to 0,18 depending on different scenarios	80	N/A	1. Guideline IA COM 2. Prep Study 3. Prep Study
ENTR 2	**Transformers**		4	0.0848	3.23	N/A	1. Prep Study 2. Prep Study, prices of large industrial consumers 3. Prep Study
ENTR 3	**Sound and imaging equipment**		2.2	0.16	N/A	N/A	1. Prep Study 2. Prep Study
ENTR 4	**Industrial and laboratory furnaces and ovens**		N/A	N/A	N/A	N/A	
ENTR 5	**Machine tools**		N/A	N/A	N/A	N/A	
ENTR 6	**Air conditioning and ventilation systems**		N/A	N/A	N/A	N/A	
ENTR ##	**Medical imaging equipment**		N/A	N/A	N/A	N/A	
ENV 1	**Water Using Products**		N/A	N/A	N/A	N/A	

SOURCE: PREPARATORY STUDIES AND *IMPACT ASSESSMENTS

Different preparatory studies use different discount rates for economic calculations. This is shown in Table 10 with respect to the product groups of the Commission's preliminary working programme.

For the purpose of this study, a unique real **discount rate of 8%** has been applied. Such a discount rate is typical for calculations from the perspective of the users of the ecodesign products. This is also consistent with the fact that end-user prices have been taken for the economic calculations in this study following the end-user prices given in the preparatory studies. In a sensitivity analysis in Chapter 4.5, a real discount rate of **4%** has been taken, which will be more suitable for calculations from a societal or public perspective.

All prices and costs are calculated as real values, with price basis 2005. For investment and installation costs, annuities have been calculated applying the discount rate mentioned above and the lifetimes as shown in Table 10. Most of the prices and costs used for the calculations are from the respective preparatory studies.

The energy prices assumed for the calculations are shown in the following Table 11. In addition, sensitivity analyses have been carried out assuming energy prices to be frozen at the 2005 level.

Table 11: Energy prices assumed for the purpose of this study

[Euro2005 / MWh]	2000	2005	2010	2015	2020	2025	2030
Average end-user price of heating fuels	38,24	50,92	67,36	86,49	111,07	142,39	144,60
Average end-user price of electricity	95,60	98,00	97,50	99,65	101,80	103,40	105,00

SOURCE: WUPPERTAL INSTITUTE BASED ON EUROSTAT AND DG ENER 2008

4.3.4 Dynamics of change: replacement rates and tiers of regulation

The period during which a product stock could become a more energy-efficient one depends on the replacement rates in the market and on the point in time at which the change towards increased energy-efficiency starts, which depends on the tiers of the ecodesign implementing measures and further measures. The respective assumptions for the product groups of the Commission's preliminary working programme are shown in Table 10 above. The delay factors in Table 6 explain the assumptions of the overall estimate regarding the dynamic change until 2020.

4.3.5 Rebound effects

The rebound debate reflects a concern about side effects that affect the ability of a policy or measure to achieve its primary goals. There are different definitions of the rebound effect that depend on the definition of resource efficiency or energy efficiency and on the boundaries drawn (cf., e. g., HERTWICH 2005, SCHETTKAT 2009). For the purpose of this paper, the following definition is applied:

If the use of an environmentally, socially or economically more efficient good (e. g., an infrastructure that enables an increase in resource efficiency or allows people to save time, or a product or service that is resource-efficient and saves costs of consumers) induces effects that partly or even fully compensate the ecological, social or economic efficiency gains achieved by this good, this can be called a rebound effect.

So there is a link between using the good and the side effects observed. In other words, general economic innovation and growth effects should not be called rebound effects following this definition. Rebound effects can be observed on different levels: micro (individuals, companies), meso (households) or macro (society, economy). It can be differentiated between direct and indirect rebound effects:

- If the efficiency gains of using a more resource-efficient good (e. g. a compact fluorescent lamp or a hybrid car) are reduced by using this good to a larger extent (e. g., longer hours of use per day or larger distances the car is driven) this can be called a direct rebound effect, as long as both effects will be directly linked to each other.
- If the resource efficiency gains increase the possibilities and abilities to act (e. g., increase in time or income, reduced burden, etc.), and if making use of this increased ability leads to unsustainable effects in other areas (e.g., spending the additional time or money gained for a weekend flight to a beach resort), this can be called an indirect rebound effect.

There is a large body of literature suggesting that the rebound effect is indeed real in many situations. The key issue is the magnitude of the rebound effect. Some literature on energy efficiency even claims the total rebound effect to be larger than 100% referring to the statistical „real-world correlation between rising energy consumption and rising efficiency of energy services"(„backfire"; cf., e. g., MADLENER and ALCOTT 2008).

In fact, the magnitude of the rebound effect depends on several factors. First, it depends on its definition. For example, if only direct rebound effects are counted, it is, of course, smaller than if indirect effects are included. Second, it depends on the type of good and the economic agent looked at. Third, it depends on various other assumptions, the methodology and database of the empirical study or modelling exercise carried out.

Different empirical studies show that direct rebound effects usually are in the range between 10% and 30%, sometimes even lower or higher (IEA 2005; DIMITROPOULOS 2007; SORRELL 2007). In their

estimate of the macroeconomic rebound effect, BARKER et al. (2009) treat the direct rebound effect as exogenous, with globally about 10%, based on estimates from the literature.

Table 12: Direct rebound effects, empirically estimated

Sector	Field of application	Direct rebound effect	Average
Private Households	Heat	10 – 30%	20%
Private Households	Air conditioning	0 – 50%	25%
Private Households	Hot water	<10 – 40%	25%
Private Households	Lighting	5 – 12%	8,5%
Private Households	White goods	0%	0%
Private Households	Cars	10 – 30%	20%
Industry and commerce	Lighting	0 – 2%	1%
Industry and commerce	Process technology	0 – 20%	10%
Overall globally*			ca. 10%

SOURCE: IEA 2005; *BARKER ET AL. 2009

The indirect rebound effect can only be estimated by applying models that take into account the relevant interdependencies, thereby setting specific boundaries of analysis. For example, in the field of energy efficiency, IRREK and THOMAS (2006), in co-operation with Prof. Hohmeyer (University of Flensburg) estimate the potential energy savings effects of 12 specific energy efficiency programmes that are part of an energy saving fund suggested for Germany. By applying a dynamic input-output model, the indirect rebound effect is estimated as the sum of embedded additional energy of energy saving measures (e. g. the additional energy used to produce a more energy-efficient motor compared to a less efficient one), and additional energy use induced by additional consumption and investment due to net reductions in energy service costs (net cost savings). The total indirect rebound effect was calculated to be 5.3% of the energy savings induced by the 12 programmes. While direct rebound effects were not calculated, it was assumed that they can be minimised by appropriate design of the energy efficiency programmes. The estimated figure of 5.3% for the indirect rebound effect is low compared to some recent international studies which reach up to about 30% or even higher (cf., e.g., BARKER et al. 2009 with 31% by 2020 and 52% by 2050), but high compared to other studies like the meta study of IEA (2005), which speaks of indirect rebound effects between 1% and 2%.

In addition, in a dynamic perspective, the use of a more efficient good can induce further effects in the medium to long term:

- For example, respective energy or resource efficiency policy can lead to a change in consumption patterns and preferences in the medium to long term. On the other hand, if efficiency happens on a larger scale, this will affect price relationships (i.e., prices will be reduced relative to the situation without efficiency gains due to reduced resource scarcety), which can in turn lead to an increased use of resources.
- Furthermore, an increase in resource efficiency increases productivity and thus competitiveness of a firm. Moreover, the successful introduction of efficient innovations can induce additional demand for these goods, for example, additional export. In this way, an increase in efficiency can induce additional growth.

However, such indirect growth-slowering or growth-triggering effects that are even more indirect than the indirect rebound effect can hardly be quantified. Moreover, since there are usually many factors influencing the position of a company in the market and the generation of demand, a one-dimension and one-direction cause-impact relationship between efficiency and growth cannot be stated. Nevertheless, this thinking about possible indirect growth-triggering effects leads to the more general question, if decoupling the use of nature from growth can be possible at all, and which factors influence growth. However, the analysis of rebound effects should - at least analytically - distinguish between these more general questions of innovation and growth that should not be discussed under the head-

ing „rebound effects“, and the measurable direct and indirect rebound effects described above that can be linked more closely to an increase in efficiency.

In addition to the rebound effects discussed so far, there is the possibility, that the increase in energy efficiency for one energy carrier leads to a change in consumption of another energy carrier. If such an effect happens on the product level (e.g., energy-effiicient solid fuel small combustion installations in Lot 15 that need electricity for control or fuel supply functions), this will be taken into account in the preparatory studies and impact assessments, and thus is included in the data basis for this overall analysis. If such an effect happens beyond the product level (on a system level, e.g., on a building level), this has not been considered here. For example, it could be discussed that installing energy-efficient lighting will reduce heat produced by the lighting system in a building and thus increases the demand for heating in winter, but reduces the demand for cooling in summer. However, usually, such effects are only of low importanc, and therefore have been neglected here. Moreover, GHG emissions per kWh electricity are higher than per kWh heat or cold, i. e. with regard to climate protection targets it is more important to save energy than to save heat / fuel. Only in particularly energy-efficient passive houses such effects can be significant.

Policies and measures can be designed in such a way that direct rebound effects are minimised. For example, a rebate for an energy-efficient refrigerator should only be paid if the energy consumption does not exceed a maximum. Otherwise, too big (e.g., US-style side-by-side) models might be bought and the trend towards bigger refrigerators will thus be enhanced. Another example is that the magnitude of the free rider effect depends on the level and conditions of the rebate given. With regard to ecodesign requirements, it matters if the formulae for the minimum energy performance standards (MEPS) or labelling schemes allows higher energy consumption for higher comfort or not. If a combination of refrigerator and freezer for private households can be in the same energy efficiency class as a small refrigerator without freezing compartment, this gives no incentive to reduce size, and energy cost savings might be used to buy a larger model.

For the purpose of this study, the direct rebound effects listed in Table 12 and - without running an economic model - a flat percentage for an indirect rebound effect of 10% have been assumed, which is in the range of rebound effects claimed by different studies (cf. also Table 6 summarising the different correction factors for each product group, which contains the rebound factors, which were used to multiply energy savings).

4.4 Results by product group

4.4.1 Results from published Ecodesign documents and other studies

Unfortunately, calculation and presentation of energy savings and GHG emissions reductions by policy options discussed and proposed or already concluded differ between preparatory studies, impact assessments and further relevant documents. In this chapter, the results as presented in these documents, are listed, without looking for consistency, i. e. without setting common assumptions, correcting for double counting etc. as discussed above. The respective figures for the different product groups of the preliminary working programme are listed in the following tables and allocated to the following categories:

- Product groups for which impact assessments / regulations are already available. Data was taken from the Impact Assessments or the Regulations.
- Product groups for which preparatory studies have been finalised but no regulation has been approved yet. Data was taken from preparatory studies and / or working documents.
- Product groups for which preparatory studies are still ongoing. Data was taken from draft chapters of preparatory studies, if already available, or EPTA et al. 2007. However, it has to be noticed that the scope of a product group as of EPTA et al. 2007 does not always match with the scope of the respective product group in the preparatory study. Therefore, this data can only be taken as a very preliminary one.

Table 13: Primary Energy Consumption 2020 for product groups of the preliminary working programme and different status quo (Status: June 2010)

		Primary Energy Consumption 2020 - BAU and Ecodesign Scenarios (in PJ/a)					
No	**Product group**	**Products for which measures are adopted**		**Products for which measures are currently being discussed**		**Products which are currently in the study phase**	
		Process/ Available documents		**Process/ Available documents**		**Process/ Available documents**	
ENER LOT 1	**Boilers and Combiboilers**			Consul-tation Forum	**BAU:** 9309 **with Ecodesign**: 6461-7691		
ENER LOT 2	**Water Heaters**			Consul-tation Forum	**BAU:** 4246 **with Ecodesign**: 2625-3419		
ENER LOT 15	**Solid fuel small combustion installations**					Prep Study ongoing	no data
ENER LOT 20	**Local room heating products,**					Prep Study ongoing	**BAU (2005)**: no data **With Ecodesign:** 10.5 -12.3
ENER LOT 21	**Central heating products**					Prep Study ongoing	no data
ENER LOT 22	**Domestic and commercial ovens**					Prep Study ongoing	no data
	TOTALS, (rough estimation)	**BAU**		**BAU**	**13555**	**BAU**	
		with Ecodesign		**with Eco-design**	**9086 - 11110**	**with Ecodesign**	
		Savings		**Savings**	**2445 - 4469**	**Savings**	

Table 14: Electricity Consumption 2020 for product groups of the preliminary working programme and different status quo (Status: June 2010)

			Electricity Consumption 2020 - BAU and Ecodesign Scenarios (in TWh/a)					
No	**Product group**		**Products for which measures are adopted**		**Products for which measures are currently being discussed**		**Products which are currently in the study phase**	
			Process/ Available documents		**Process/ Available documents**		**Process/ Available documents**	
ENER LOT 0	**Simple Set-top boxes**		Regulation/ IA	no data for 2020				
ENER LOT 3	**Computers and Monitors**				Consultation Forum	**BAU:** 53.91 – 54.80 **with Ecodesign**: 42.93 – 46.12		
ENER LOT 4	**Imaging Equipment**				Consultation Forum	**BAU:** 9.4 **with Ecodesign**: 6.2		
ENER LOT 5	**Consumer Electronics: TV**		Regulation/ IA	**BAU:** 132 **with Ecodesign**: 104				
ENER LOT 6	**Standby and Off-mode Losses**		Regulation/ IA	**BAU:** 49 **with Ecodesign**: 14				
ENER LOT 7	**External Power Supplies and Battery Chargers**		Regulation/ IA	**BAU:** 31 **with Ecodesign**: 22				
ENER LOT 8	**Office Lightning**	**Tertiary Sector Lighting**	Regulation/IA	**BAU:** 260 **with Ecodesign**: 222				
ENER LOT 9	**Street Lighting**							
ENER LOT 10	**Room air conditioning appliances**	**Comfort Fans**			Consultation Forum	**BAU:** 3.5 **with Ecodesign**: 1.01 – 1.99		
ENER LOT 10		**Residential Ventilation**			Consultation Forum	**BAU:** 10.43 **with Ecodesign**: 8.72 – 9.83		
ENER LOT 10		**Room air conditioners**					Prep Study completed	**BAU:** 156 **with Ecodesign**: 112 - 138
ENER LOT 11	**Electric Motors**	**Electric Motors**	Regulation/ IA	**BAU:** 1252 **with Ecodesign**: 1117				
ENER LOT 11		**Fans**			Consultation Forum	**BAU:** 660 **with Ecodesign**: 606		
ENER LOT 11		**Circulators**	Regulation/ IA	**BAU:** 55 **with Ecodesign**: 32				
ENER LOT 11		**Pumps**			Consultation Forum	**BAU:** 166.3 **with Ecodesign**: 159.8 – 163.4		
ENER LOT 12	**Commercial refrigerators and freezers**				Consultation Forum	**BAU:** 73 **with Ecodesign**: 47		
ENER LOT 13	**Domestic refrigerators and freezers**		Regulation/ IA	**BAU:** 83 **with Ecodesign**: 79 - 83				
ENER LOT 14	**Domestic washing machines and dishwashers**	**Washing machines**			Draft Regulation	**BAU:** 37.7 **with Ecodesign**: 31.74		
ENER LOT 14		**Dishwashers**			Draft Regulation	**BAU:** 35 **with Ecodesign:** 22.4		
ENER LOT 16	**Laundry Dryers**						Prep Study completed	**BAU:** 22.71 **with Ecodesign:** 21.11 – 22.31
ENER LOT 17	**Vacuum Cleaner**						Prep Study completed	**BAU:** 145 **with Ecodesign:** 75 - 110
ENER LOT 18	**Complex Set-Top-Boxes**				Consultation Forum	**BAU:** 11.6 **with Ecodesign**: 4.4 – 7.6		
ENER LOT 19	**Domestic Lighting**	**Part I (non directional household lamps)**	Regulation/ IA	**BAU:** 135 **with Ecodesign**: 96				
ENER LOT 19		**Part II (directional light sources)**					Prep Study completed	**BAU:** 51.1 **With Ecodesign**: 24.5 – 28.08

		Electricity Consumption 2020 - BAU and Ecodesign Scenarios (in TWh/a)					
No	**Product group**	**Products for which measures are adopted**		**Products for which measures are currently being discussed**		**Products which are currently in the study phase**	
ENER LOT 23	**Domestic and commercial hobs and grills**					Prep Study ongoing	no data
ENER LOT 24	**Professional wet appliances and dryers**					Prep Study ongoing	no data
ENER LOT 25	**Non-tertiary coffee machines**					Prep Study ongoing	no data
ENER LOT 26	**Networked standby losses**					Prep Study ongoing	no data
ENER LOT 27	**Domestic uninterruptible power supplies (UPS)**					Prep Study ongoing	no data
ENTR LOT 1	**Refrigerating and freezing equipment**					Prep Study ongoing	no data
ENTR LOT 2	**Distribution and power trans-formers**					Prep Study ongoing	no data
ENTR LOT 3	**Sound and imaging equip-ment**					Prep Study ongoing	**BAU (2005):** 30 **with Ecodesign**: 15
ENTR LOT 4	**Industrial ovens**					Prep Study ongoing	no data
ENTR LOT 5	**Machine tools**			Consul-tation Forum[1]	no data		
ENTR LOT 6	**Tertiary Air Conditioning**					Prep Study ongoing	no data
ENTR LOT ##	**Medical imaging equipment**			Consul-tation Forum[2]	no data		
ENV LOT 1	**Water using products**					Prep Study ongoing	no data
	TOTALS, (rough estimation)	**BAU**	**1997**	**BAU**	**1060.84 – 1061.73**	**BAU**	
		with Ecodesign	**1686 - 1690**	**with Eco-design**	**930.2 – 942.28**	**with Ecodesign**	
		Savings	**307 - 311**	**Savings**	**119.45 - 130.64**	**Savings**	

[1] Until now no preparatory study was tendered, a voluntary agreement is foreseen.

Table 15: GHG emissions 2020 for product groups of the preliminary working programme and different status quo (Status: June 2010)

No	Product group		GHG emissions 2020 - BAU and Ecodesign Scenarios (in Mt CO2 eq.)					
			Products for which measures are adopted		Products for which measures are currently being discussed		Products which are currently in the study phase	
			Process/ Available documents		Process/ Available documents		Process/ Available documents	
ENER LOT 0	**Simple Set-top boxes**		Regulation/ IA	**BAU:** 5 **with Ecodesign**: 2				
ENER LOT 1	**Boilers and Combiboilers**				Consultation Forum	**BAU:** 537 **with Ecodesign**: 373-444		
ENER LOT 2	**Water Heaters**				Consultation Forum	**BAU:** 245 **with Ecodesign**: 151-197		
ENER LOT 3	**Computers and Monitors**				Consultation Forum	**BAU:** 36 **with Ecodesign**: 28-30		
ENER LOT 4	**Imaging Equipment**				Consultation Forum	**BAU:** 4 **with Ecodesign**: 2		
ENER LOT 5	**Consumer Electronics: TV**		Regulation/ IA	**BAU:** 51 **with Ecodesign**: 40				
ENER LOT 6	**Standby and Off-mode Losses**		Regulation/ IA	**BAU:** 19.81 **with Ecodesign**: 6				
ENER LOT 7	**External Power Supplies and Battery Chargers**		Regulation/ IA	**BAU:** 12 **with Ecodesign**:9				
ENER LOT 8	**Office Lightning**	**Tertiary Sector Lighting**	Regulation/IA	**BAU:** 104 **with Ecodesign**: 89				
ENER LOT 9	**Street Lighting**							
ENER LOT 10	**Room air conditioning appliances**	**Comfort Fans**			Consultation Forum	**BAU:** 3 **with Ecodesign**: 1		
ENER LOT 10		**Residential Ventilation**			Consultation Forum	**BAU:** 4 **with Ecodesign**: 4		
ENER LOT 10		**Room air conditioners**					Prep Study completed	**BAU:** 76 **with Ecodesign**: 62-72
ENER LOT 11	**Electric Motors**	**Electric Motors**	Regulation/ IA	**BAU:** 574 **with Ecodesign**: 510				
ENER LOT 11		**Fans**			Consultation Forum	**BAU:** 305.6 **with Ecodesign**: 281		
ENER LOT 11		**Circulators**	Regulation/ IA	**BAU:** 25 **with Ecodesign**: 15				
ENER LOT 11		**Pumps**			Consultation Forum	**BAU:** 64 **with Ecodesign**: 61-63		
ENER LOT 12	**Commercial refrigerators and freezers**				Consultation Forum	**BAU:** 44 **with Ecodesign**: 30		
ENER LOT 13	**Domestic refrigerators and freezers**		Regulation/ IA	**BAU:** 38 **with Ecodesign**: 35-37				
ENER LOT 14	**Domestic washing machines and dishwashers**	**Washing machines**			Draft Regulation	**BAU:** 20 **with Ecodesign**: 17		
ENER LOT 14		**Dishwashers**			Draft Regulation	**BAU:** 19 **with Ecodesign:** 12		
ENER LOT 15	**Solid fuel small combustion installations**						Prep Study ongoing	**BAU:** no data **with Ecodesign:** no data
ENER LOT 16	**Laundry Dryers**						Prep Study completed	**BAU:** 12 **with Ecodesign:** 10
ENER LOT 17	**Vacuum Cleaner**						Prep Study completed	**BAU:** 56 **with Ecodesign:** 29-42
ENER LOT 18	**Complex Set-Top-Boxes**				Consultation Forum	**BAU:** 6 **with Ecodesign**: 2-5		

			GHG emissions 2020 - BAU and Ecodesign Scenarios (in Mt CO2 eq.)					
No	**Product group**		**Products for which measures are adopted**		**Products for which measures are currently being discussed**		**Products which are currently in the study phase**	
ENER LOT 19	**Domes-tic Lighting**	**Part I (non direc-tional household lamps)**	Regulation/ IA	**BAU:** 54 **with Ecodesign**: 39				
ENER LOT 19		**Part II (directional light sources)**					Prep Study completed	**BAU:** 20 **With Ecodesign**: 9-11
ENER LOT 20	**Local room heating products,**						Prep Study ongoing	**BAU (2005)**: 430* **With Ecodesign:** no data
ENER LOT 21	**Central heating products**						Prep Study ongoing	no data
ENER LOT 22	**Domestic and commercial ovens**						Prep Study ongoing	**BAU (2005)**: 369* **With Ecodesign:** no data
ENER LOT 23	**Domestic and commercial hobs and grills**						Prep Study ongoing	no data
ENER LOT 24	**Professional wet appliances and dryers**						Prep Study ongoing	no data
ENER LOT 25	**Non-tertiary coffee machines**						Prep Study ongoing	no data
ENER LOT 26	**Networked standby losses**						Prep Study ongoing	no data
ENER LOT 27	**Domestic uninterruptible power supplies (UPS)**						Prep Study ongoing	no data
ENTR LOT 1	**Refrigerating and freezing equipment**						Prep Study ongoing	**BAU (2005)**: 29.5* **With Ecodesign:** no data
ENTR LOT 2	**Distribution and power trans-formers**						Prep Study ongoing	**BAU (2005):** 54 **with Ecodesign**: no data
ENTR LOT 3	**Sound and imaging equip-ment**						Prep Study ongoing	**BAU (2005):** 7 **with Ecodesign**: no data
ENTR LOT 4	**Industrial ovens**						Prep Study ongoing	no data
ENTR LOT 5	**Machine tools**				Consul-tation Forum[2]	**BAU: with Ecodesign**:		
ENTR LOT 6	**Tertiary Air Conditioning**						Prep Study ongoing	**BAU (2005)**: 50 **with Ecodesign:**
ENTR LOT ##	**Medical imaging equipment**				Consul-tation Forum[2]	**BAU: with Ecodesign**:		
ENV LOT 1	**Water using products**						Prep Study ongoing	no data
	TOTALS, (rough estimation)		**BAU**	**882.81**	**BAU**	**1287.6**	**BAU**	
			with Ecodesign	**745 - 747**	**with Eco-design**	**962 - 1086**	**with Ecodesign**	
			Savings	**135.81 - 137.81**	**Savings**	**201.6 - 325,6**	**Savings**	

SOURCE: PREPARATORY STUDIES; IMPACT ASSESSMENTS; WORKING DOCUMENTS; EXPLANATORY NOTES TO ADOPTED REGULATIONS;
*EPTA ET AL. 2007

Table 15 shows that there are partly missing data or scenarios with a large range of options. Only the Regulations and Impact Assessments demonstrate clear data. The second column with data discussed within the Consultation Forum can only be a very rough estimate, and discussions are still ongoing. Presently the Regulations that were already adopted within the Ecodesign Directive framework claim to reduce GHG emissions by approximately 135-138 Mt CO_2 eq. in 2020 compared to the business as usual scenario, as said before not yet corrected for double counting, comparable assumptions etc. For the products for which the process is still ongoing their possible impact is still discussed and relevant data is missing. Especially for the product groups for which preparatory study have only

[2] Until now no preparatory study was tendered, a voluntary agreement is foreseen.

started or tendered recently, no option is available. For the product groups with finalised preparatory studies data can only be estimated and are a result of the analysis of different scenarios.

4.4.2 Own estimates by Wuppertal Institute based on data and information available

Based on data available from different source and with the assumptions made and the methodology as explained in Chapter 4.3, Wuppertal Institute has carried out a very rough overall estimate of energy savings and GHG emissions reductions by ecodesign implementing measures for the different product groups. Since several correction factors have been applied, which have been summarised in Table 6: Correction factors applied to energy savings calculated (rounded)

, the results are lower than in impact assessments and preparatory studies.

Table 16 summarises the results by product group on energy savings, GHG emissions reductions and cost savings. Thereby the table points out the maximum (max.) and minimum (min.) achievable energy savings and emissions reductions that can be expected from ecodesign implementing measures following mainly the range of possible resuls by policy options calculated in the scenario analyses of preparatory studies and impact assessments, with the correction factors as explained in Chapter 4.3, and with some own modelling by Wuppertal Institute for those product groups for which not sufficient data has been available yet in preparatory studies.

Table 16: Results by product group

Product group	Heat/Fuel savings		Electricity savings		GHG Emissions reductions		Cost savings at max.	
	minimum implementation [TWh final energy]	maximum implementation [TWh final energy]	minimum implementation [TWh final energy]	maximum implementation [TWh final energy]	minimum implementation [Mio. t CO2eq]	maximum implementation [Mio. t CO2eq]	Annual energy cost savings maximum implementation [million Euro]	Net annual total cost savings (8% real discount rate) [million Euro]
Simple set top boxes	0,0	0,0	7,2	7,2	2,8	2,8	730,7	730,7
Boilers	183,7	323,3	12,4	21,9	15,4	27,1	38.140,3	
Water heaters	82,3	161,4	4,9	9,5	6,6	13,0	18.898,0	
Computers and monitors	0,0	0,0	5,5	7,6	2,1	2,9	773,2	
Imaging equipment	0,0	0,0	2,3	2,3	0,9	0,9	236,2	
Consumer electronics: TV	0,0	0,0	22,3	22,3	8,6	8,6	2.273,3	2.265,4
Standby and off-mode losses	0,0	0,0	27,9	27,9	10,7	10,7	2.841,6	1.369,2
External power supplies and battery charges	0,0	0,0	7,2	7,2	2,8	2,8	730,7	353,1
Office lighting	0,0	0,0	32,1	32,1	12,3	12,3	3.268,9	1.667,1
Street lighting	part of office lighting number							
Comfort fans	0,0	0,0	1,1	1,8	0,4	0,7	183,8	
Residential ventilation	0,0	0,0	0,4	1,2	0,2	0,5	126,2	
Room air-conditioners	0,0	0,0	10,1	24,7	3,9	9,5	2.513,0	
Electric motors	0,0	0,0	83,4	83,4	32,0	32,0	8.494,5	8.017,6
Fans	0,0	0,0	34,7	47,7	13,3	18,3	4.854,0	
Circulators	0,0	0,0	18,3	18,3	7,0	7,0	1.867,4	1.670,4
Pumps	0,0	0,0	2,3	5,2	0,9	2,0	531,2	
Commercial refrigerators and freezers	0,0	0,0	12,3	16,6	4,7	6,4	1.691,5	1.653,2
Domestic regrigerators and freezers	0,0	0,0	3,6	3,6	1,4	1,4	363,4	186,3
Domestic washing machines and dish washers	0,0	0,0	15,1	15,1	5,8	5,8	1.533,0	
Solid fuel small combustion installations	6,1	18,4	0,0	0,1	0,4	1,1	2.047,8	1.873,2
Laundry Dryers	0,0	0,0	0,3	1,3	0,1	0,5	129,2	
Vacuum Cleaner	0,0	0,0	25,1	25,1	9,6	9,6	2.557,5	
Complex set-top boxes	0,0	0,0	2,6	4,6	1,0	1,8	467,7	
Domestic lighting Part I	0,0	0,0	25,3	31,7	9,7	12,2	3.222,9	3.010,8
Domestic lighting Part II	0,0	0,0	78,9	81,5	30,3	31,3	8.301,5	8.301,5
Local room heating products	49,1	89,5	6,6	12,1	5,4	9,8	11.168,7	
Central heating products	merged with local room heating products							
Domestic and commercial ovens	merged with local room heating products							
Domestic and commercial hobs and grills	0,0	0,0	2,7	8,0	1,0	3,1	812,8	
Professional wet appliances and dryers	0,0	0,0	0,1	0,4	0,0	0,1	37,8	
Non-tertiary coffee machines	0,0	0,0	0,9	2,6	0,3	1,0	269,0	
Networked standby losses	0,0	0,0	3,1	3,1	1,2	1,2	314,6	
Refrigerating and freezing equipment	0,0	0,0	15,3	15,3	5,9	5,9	1.559,5	
transformers	0,0	0,0	3,6	6,8	1,4	2,6	695,3	80,0
Sound and imaging equipment	0,0	0,0	8,3	8,3	3,2	3,2	845,0	
Industrial ovens	0,1	0,3	0,4	1,0	0,2	0,4	135,7	
Machine tools	0,0	0,0	15,0	22,5	5,8	8,6	2.288,5	
Tertiary air conditioning	0,0	0,0	8,7	20,2	3,3	7,8	2.058,3	
Medical imaging equipment	0,0	0,0	0,0	0,0	0,0	0,0	1,8	
	321,3	592,8	500,0	600,3	210,5	264,7	126.964,2	

SOURCE: WUPPERTAL INSTITUTE

In the Appendix to this report, the results for the different product groups are presented in separate tables with more information on the different product groups. These tables also include data directly taken from impact assessments, working documents and preparatory studies as well as own modelling or rough expert estimates by Wuppertal Institute for comparison.

In total, GHG emission reductions between 211 and 265 million t CO_2eq can be achieved by ecodesign implementing measures in 2020 compared to BAU development. This is induced by heat / fuel savings in the range of 321 to 593 TWh/year, and electricity savings between 500 and 600 TWh/year. Energy costs of up to 127 billion Euro can be saved by 2020 compared to BAU development if the maximum of energy savings through implementing measures can be realised and with the strongly increasing energy prices assumed here. With constant energy prices at the 2005 price level, energy cost savings sum up to about 90 billion Euro in 2020 compared to BAU development.

The following subchapters aggregate the overall results per product group from different perspectives.

4.5 Results by stage of Ecodesign Directive process

The following Table 17 aggregates the product group-specific results by stage of the Ecodesign Directive process. Again the results are differentiating between maximum and minimum savings that can be expected from ecodesign implementing measures.

Table 17: Summarised results that can be achieved by 2020 of partly very rough estimate by stage of Ecodesign Directive process

Impact category	Unit	Own estimate by Wuppertal Institute	
		Implementing Measure	
		min	max
Allready regulated products with available impact assessment: ENER 0: simple set-top boxes, ENER 5-9, ENER 11: Motors and circulators, ENER 13, ENER 19-I			
Heat / Fuel savings	TWh	0	0
Electricity savings	TWh	227	234
GHG emissions reductions	Mio. t CO2 eq.	87	90
Energy cost savings	Mio. Euro		23,793
Net cost savings (8% real discount rate)	Mio. Euro		19,721
Net cost savings (4% real discount rate)	Mio. Euro		20,339
Energy cost savings (constant energy prices)	Mio. Euro		23,130
Net cost savings (8%) (constant energy prices)	Mio. Euro		18,607
Net cost savings (4%) (constant energy prices)	Mio. Euro		19,676
Not yet regulated products with available preparatory studies: ENER 1-4, ENER 10, ENER 11: fans and pumps, ENER 12, ENER 14, ENER 16-18, ENER 19-II			
Heat / Fuel savings	TWh	272	503
Electricity savings	TWh	208	266
GHG emissions reductions	Mio. t CO2 eq.	96	131
Energy cost savings	Mio. Euro		82,984
Energy cost savings (constant energy prices)	Mio. Euro		52,349
Not yet regulated products with preparatory studies not yet finished: ENER 15, ENER 20-26, ENTR 1-6, Medical imaging equipment			
Heat / Fuel savings	TWh	49	90
Electricity savings	TWh	65	100
GHG emissions reductions	Mio. t CO2 eq.	28	44
Energy cost savings	Mio. Euro		20,187
Energy cost savings (constant energy prices)	Mio. Euro		14,579

SOURCE: WUPPERTAL INSTITUTE

The results show that the regulations already implemented are expected to achieve electricity savings of around 230 TWh/year in 2020 compared to BAU development, resulting in GHG emissions reductions of up to 90 Mt CO_2eq/year and net cost savings of more than 19 billion Euro/year (8% real discount rate). With 4% real discount rate, net cost savings are more than 20 billion Euro/year. For the estimate of impacts for these product groups, the results from impact assessments have been cor-

rected for rebound effects, double counting for motors, for possible over estimate of BAU development and thus savings, and for possible consumer behaviour deviation with regard to domestic lighting.

The economic results for the not yet regulated products with available preparatory studies are dominated by savings that can be achieved with ambitious but realistic implementing measures for boilers and water heaters. Regulations of these two product groups can lead to more than half of the 82 billion Euro energy cost savings expected to be realised in 2020 compared to BAU development. This is based on the assumption of a strong increase in energy prices, particularly fuel prices. With constant energy prices at the 2005 price level, expected total energy cost savings for these not yet regulated product groups might sum up to about 52 billion Euro per year in 2020 compared to BAU development. The largest GHG emissions reductions for these not yet regulated product groups are expected to come from electricity savings, particularly in the fields of lighting, ventilation and air-conditioning. For this less secure estimate of impacts of these product groups, the results from preparatory studies (and working documents as far as available) have been corrected for rebound effects and for possible over estimate of BAU development and thus savings. In addition, results have been compared with results from other studies and own modelling by Wuppertal Institute, and results regarding Lot ENER 12 been corrected by own modelling.

For the not yet regulated product groups with preparatory studies not yet finished energy cost savings of up to 20 billion Euro per year in 2020 are still expected (up to 15 billion Euro per year with constant energy prices at the 2005 price level), although regulations of these product groups will still take some time to come. For the very rough estimate of impacts of these product groups data from preparatory studies (as far as task reports have been availale), industry and EPTA et al. 2007, and some rough own modelling by Wuppertal Institute have been used. In particular, results regarding Lot ENER 15 have been corrected by own modelling.

4.6 Results by field of application / technology field and domestic or commercial / industrial use of product groups

Table 18: Summarised results of rough estimate by field of application/technology

Group	Lot	Product group	Heat/Fuel savings		Electricity savings		GHG Emissions reductions		Cost savings at max. implementation	
			maximum implementation	minimum implementation	maximum implementation	minimum implementation	maximum implementation	minimum implementation	Annual energy cost savings maximum implementation	Net annual total cost savings (8% real discount rate)
Residential			[TWh final energy]	[TWh final energy]	[TWh final energy]	[TWh final energy]	[Mio. t CO2eq]	[Mio. t CO2eq]	[million Euro]	[million Euro]
White goods	TREN 13	Domestic refrigerators and freezers	0,0	0,0	3,6	3,6	1,4	1,4	363,4	186,3
	TREN 14	Dishwashers and washing machines	0,0	0,0	15,1	15,1	5,8	5,8	1.533,0	
	TREN 16	Laundry Dryers	0,0	0,0	1,3	0,3	0,5	0,1	129,2	
	Total White Goods		0,0	0,0	19,9	18,9	7,6	7,3	2.025,6	
Other household appliances	TREN 17	Vacuum cleaner	0,0	0,0	25,1	25,1	9,6	9,6	2.557,5	
	Total Other household appliances		0,0	0,0	25,1	25,1	9,6	9,6	2.557,5	
Cooking Appliances	TREN 23	Domestiv hobs and grills	0,0	0,0	4,0	1,3	1,5	0,5	406,4	
	TREN 25	Non-tertiary coffee machines	0,0	0,0	2,6	0,9	1,0	0,3	269,0	
	Total Cooking appliances		0,0	0,0	6,6	2,2	2,5	0,8	675,4	
HVAC	TREN 1	Boilers and Combiboilers	258,7	147,0	17,5	9,9	21,6	12,3	30.512,2	
	TREN 2	Water Heaters	129,1	65,9	7,6	3,9	10,4	5,3	15.118,4	
	TREN 10	Ventilation and air conditioning; fans	0,0	0,0	27,7	11,6	10,6	4,5	2.823,0	
	TREN 11	Fans; Circulators	0,0	0,0	13,9	12,6	5,4	4,9	1.419,1	835,2
	TREN 15	Solid fuel small combustion installations	16,5	5,5	0,1	0,0	1,0	0,3	1.843,0	1.685,8
	TREN 20	Local room heating products	67,1	36,8	9,1	5,0	7,4	4,0	8.376,5	
	TREN 21	Central heating products	merged with TREN 20							
	TREN 22	Domestic ovens	merged with TREN 20							
	Total HVAC		471,4	255,1	75,9	43,1	56,4	31,3	60.092,2	
Lighting	TREN 19	Domestic lighting - Part I	0,0	0,0	31,7	25,3	12,2	9,7	3.222,9	3.010,8
	TREN 19	Domestic lighting - Part II	0,0	0,0	81,5	78,9	31,3	30,3	8.301,5	8.301,5
	Total Lighting		0,0	0,0	113,2	104,2	43,5	40,0	11.524,5	11.312,3
Information and Communication Technologies	TREN 3	Computers and monitors	0,0	0,0	4,9	3,6	1,9	1,4	502,6	
	TREN 4	Imaging equipment	0,0	0,0	0,2	0,2	0,1	0,1	23,6	
	ENTR 3	Sound and imaging equipment	0,0	0,0	6,2	6,2	2,4	2,4	633,7	
	TREN 5	TV	0,0	0,0	22,3	22,3	8,6	8,6	2.273,3	2.265,4
	TREN 6	Standby and Off-mode losses	0,0	0,0	22,6	22,6	8,7	8,7	2.301,7	1.109,1
	TREN 7	External power supplies and battery	0,0	0,0	5,0	5,0	1,9	1,9	511,5	247,1
	TREN	Set top boxes	0,0	0,0	7,2	7,2	2,8	2,8	730,7	730,7
	TREN 18	Complex Set top boxes	0,0	0,0	4,6	2,6	1,8	1,0	467,7	
	TREN 26	Networked standby losses	0,0	0,0	1,5	1,5	0,6	0,6	157,3	
	Total Information and Communication technologies		0,0	0,0	74,7	71,3	28,7	27,4	7.602,1	
Total DOMESTIC			471,4	255,1	315,5	264,8	148,3	116,4	84.477,3	

Group	Lot	Product group	Heat/Fuel savings		Electricity savings		GHG Emissions reductions		Cost savings at max. implementation	
			maximum implementation	minimum implementation	maximum implementation	minimum implementation	maximum implementation	minimum implementation	Annual energy cost savings maximum implementation	Net annual total cost savings (8% real discount rate)
Commercial and Industrial			[TWh final energy]	[TWh final energy]	[TWh final energy]	[TWh final energy]	[Mio. t CO2eq]	[Mio. t CO2eq]	[million Euro]	[million Euro]
Appliances (refrigerating, drying, cooking)	TREN 12	Commercial refrigerators and freezers	0,0	0,0	16,6	12,3	6,4	4,7	1.691,5	1.653,2
	ENTR 1	Refrigerating and freezing equipment	0,0	0,0	15,3	15,3	5,9	5,9	1.559,5	0,0
	TREN 23	Commercial hobs and grills	0,0	0,0	4,0	1,3	1,5	0,5	406,4	
	TREN 24	Professional wet appliances and dryers	0,0	0,0	0,4	0,1	0,1	0,0	37,8	
	Total Appliances		0,0	0,0	36,3	29,0	13,9	11,1	3.695,2	
HVAC	TREN 1	Boilers and Combiboilers	64,7	36,7	4,4	2,5	5,4	3,1	7.628,1	
	TREN 2	Water Heaters	32,3	16,5	1,9	1,0	2,6	1,3	3.779,6	
	TREN 15	Solid fuel small combustion installations	1,8	0,6	0,0	0,0	0,1	0,0	204,8	187,3
	TREN 20	Local room heating products	22,4	12,3	3,0	1,7	2,5	1,3	2.792,2	
	TREN 21	Central heating products	merged with TREN 20							
	TREN 22	Commercial ovens	merged with TREN 20							
	ENTR 4	Industrial ovens	0,3	0,1	1,0	0,4	0,4	0,2	135,7	
	ENTR 6	Tertiary Air conditioning	0,0	0,0	20,2	8,7	7,8	3,3	2.058,3	
	Total HVAC		121,4	66,2	30,6	14,2	18,7	9,3	16.598,5	
Lighting	TREN 8	Office Lighting								
	TREN 9	Street Lighting								
	Total Lighting		0,0	0,0	32,1	32,1	12,3	12,3	3.268,9	1.667,1
Information and Communication Technologies	TREN 3	Computers and monitors	0,0	0,0	2,7	1,9	1,0	0,7	270,6	
	TREN 4	Imaging Equipment	0,0	0,0	2,1	2,1	0,8	0,8	212,6	
	TREN 6	Standby and Off-mode losses	0,0	0,0	5,3	5,3	2,0	2,0	539,9	260,2
	TREN 26	Networked standby losses	0,0	0,0	1,5	1,5	0,6	0,6	157,3	
	TREN 7	External power supplies and battery chargers	0,0	0,0	2,2	2,2	0,8	0,8	219,2	105,9
	ENTR 3	Sound and imaging equipment	0,0	0,0	2,1	2,1	0,8	0,8	211,2	
	Total Information and Communication Technologies		0,0	0,0	15,8	15,1	6,1	5,8	1.610,8	
Other technologies	TREN 11	Electric motors; pumps; fans; circulators	0,0	0,0	140,7	126,2	54,0	48,4	14.327,9	8.852,8
	ENTR 2	Transformers	0,0	0,0	6,8	3,6	2,6	1,4	695,3	80,0
	ENTR 5	Machine tools	0,0	0,0	22,5	15,0	8,6	5,8	2.288,5	
		Medical imaging equipment	0,0	0,0	0,0	0,0	0,0	0,0	1,8	
	Total Other Technologies		0,0	0,0	170,1	144,8	65,3	55,6	17.313,5	
Total COMMERCIAL AND INDUSTRIAL			121,4	66,2	284,9	235,2	116,4	94,1	42.486,9	

SOURCE: WUPPERTAL INSTITUTE

Table 18 summarises results by field of application or technology field and by domestic or commercial / industrial use of product groups. More than half of the GHG emissions reductions by ecodesign implementing measures can be achieved in the residential sector, with annual energy cost savings of more than 80 billion Euro per year in 2020 compared to BAU development (nearly 55 billion Euro per year in 2020 with constant energy prices at the 2005 price level), mainly induced by measures in the heating sector. In the commercial and industrial sector, energy costs of more than 40 billion Euro per year can be saved in 2020 compared to BAU development (more than 34 billion Euro per year with constant energy prices at the 2005 price level).

For the differentiation between domestic and commercial / industrial use the following very rough assumptions have been made, which are partly based on preparatory studies or other studies, partly are just an expert guess.

Table 19: Roughly assumed share of domestic / commercial energy use of the different product groups

Lot	Product group	Percentage domestic	Percentage commercial
TREN 0	Simple set top boxes	100%	0%
TREN 1	Boilers	80%	20%
TREN 2	Water heaters	80%	20%
TREN 3	Computers and monitors	65%	35%
TREN 4	Imaging equipment	10%	90%
TREN 5	Consumer electronics: TV	100%	0%
TREN 6	Standby and off-mode losses	81%	19%
TREN 7	External power supplies and battery charges	70%	30%
TREN 8	Office lighting	0%	100%
TREN 9	Street lighting	0%	100%
TREN 10	Comfort fans	100%	0%
TREN 10	Residential ventilation	100%	0%
TREN 10	Room air-conditioners	100%	0%
TREN 11	Electric motors	0%	100%
TREN 11	Fans	10%	90%
TREN 11	Circulators	50%	50%
TREN 11	Pumps	0%	100%
TREN 12	Commercial refrigerators and freezers	0%	100%
TREN 13	Domestic regrigerators and freezers	100%	0%
TREN 14	Domestic washing machines and dish washers	100%	0%
TREN 15	Solid fuel small combustion installations	90%	10%
TREN 16	Laundry Dryers	100%	0%
TREN 17	Vacuum Cleaner	100%	0%
TREN 18	Complex set-top boxes	100%	0%
TREN 19	Domestic lighting Part I	100%	0%
TREN 19	Domestic lighting Part II	100%	0%
TREN 20	Local room heating products	75%	25%
TREN 21	Central heating products	75%	25%
TREN 22	Domestic and commercial ovens	75%	25%
TREN 23	Domestic and commercial hobs and grills	50%	50%
TREN 24	Professional wet appliances and dryers	0%	100%
TREN 25	Non-tertiary coffee machines	100%	0%
TREN 26	Networked standby losses	50%	50%
ENTR 1	Refrigerating and freezing equipment	0%	100%
ENTR 2	Distribution and power transformers	0%	100%
ENTR 3	Sound and imaging equipment	75%	25%
ENTR 4	Industrial ovens	0%	100%
ENTR 5	Machine tools	0%	100%
ENTR 6	Tertiary air conditioning	0%	100%
	Medical imaging equipment	0%	100%

SOURCE: OWN ESTIMATE BY WUPPERTAL INSTITUTE

4.7 Results differentiating between GHG emissions reductions from electricity and GHG emissions reductions from heat/fuel

The following Table 20 differentiates the overall GHG emissions reductions achieved by electricity and heat / fuel savings. Most of the GHG emissions reductions are expected to be realised in the electricity sector.

Table 20: Summarised results of rough estimate by electricity and heat/fuel

GHG emissions reductions in 2020 compared to BAU	Electricity		Heat / Fuel	
	max. IM [Mio. t CO2eq]	min. IM [Mio. t CO2eq]	max. IM [Mio. t CO2eq]	min. IM [Mio. t CO2eq]
TOTAL	**231**	**192**	**34**	**19**

SOURCE: WUPPERTAL INSTITUTE

4.8 Results within ETS and outside ETS scheme

The results in the electricity sector might be questioned by pointing to the function of the emission trading scheme (ETS). In the ETS, emissions in the electricity generation sector are limited by an overall cap. Folllowing neo-classical argumentation, if electricity demand decreases, prices for CO_2 allowances will decrease, too. This, in turn, will lead to a shift in electricity generation from (more expensive) plants with low specific emissions to (cheaper) plants with high specific emissions. In the end, following this theory, GHG emissions in this sector will be kept constant and near the cap.

However, this argumentation has not been followed here. On the one hand, this would only work in the ideal case of a fully competitive market with transactions happening in one point of the market and with complete information of all market actors. In fact, the reality shows that the market is not fully fucntioning. Although there are enormous economic electricity savings potentials with substantial net negative CO_2 emissions reduction costs, the market only partly realises them and produces and consumes electricity instead. There are significant barriers and obstacles in the market that hinder the realisation of economic electricity saving potentials. These barriers are not overcome by the ETS, but can be at least partly overcome by ecodesign implementing measures. In order to realise economic electricity savings and GHG emissions reduction potentials to a larger extent and in order to stimulate competition between actions to reduce electricity demand and electricity generation, the ETS has always to be combined with technology-specific and/or sector-specific policies and measures. This is the result of many empirical studies and evaluations in the final energy sector and is summarised, e.g., by (Ecofys et al. 2006) and (Irrek / Thomas 2008). On the other hand, the neo-classical thinking is just a short-term one, which ignores the dynamic policy setting in a multilevel governance scheme. Policies and measures like ecodesign implementing measures that reduce electricity demand enable to set more ambitious caps in the ETS. In general, ETS and technology-specific and sector-specific policies and measures should be linked as follows (Irrek / Thomas 2008):

- Caps in the ETS have to be set in such a way that they take into account impacts of energy efficiency policies and measures.
- In those areas, in which both the ETS and other policies and measures are effective, double counting of impacts in the national allocation plan has to be avoided, particularly if there are national offset projects or white certificate schemes.
- It has to be considered how ETS and other policies and measures influence decisions of market actors. For example, additional policies and measures to increase energy efficiency can induce energy companies not only to optimise their power generation portfolio within the ETS but to offer specific programmes or services on the demand side.

The following Table 21 summarises results of ecodesign implementing measures by their impact within the emissions trading scheme (ETS) and outside the ETS, assuming that the GHG emissions reductions are not reduced by increased use of power plants with highspecific emissions. For this calculation, it is assumed that about 65% of the electricity savings affect electricity generated in thermal

power plants that are regulated under the ETS. This has been calculated as follows: The share of conventional thermal power plants in total gross electricity generation in EU-27 is about 55.5%, of which about 2% might be decentralised generation below the thresholds of the ETS regulatory scheme. However, since a significant part of electricity savings by implementing measures will be in peak-load time and since conventional thermal power plants particularly contribute to electricity generation in peak-load times, the resulting share of conventional thermal power plants not including decentralised generation has been weighted by 120%, resulting into the about 65% share of electricity generation affected by implementing measures that would have been produced in power plants under the ETS if it were not saved.

Table 21: Summarised results of rough estimate of GHG emissions reductions in ETS and non-ETS areas

GHG emissions reductions in 2020 compared to BAU	**ETS**		**Non-ETS**	
	max. IM	min. IM	max. IM	min. IM
	[Mio. t CO2eq]	[Mio. t CO2eq]	[Mio. t CO2eq]	[Mio. t CO2eq]
TOTAL	**151**	**125**	**114**	**85**

SOURCE: WUPPERTAL INSTITUTE

4.9 Country-specific results

The preparatory studies and impact assessments do not give much country-specific data or information, often only some country-specific stock or sales data, if any.

However, for Table 22, overall emissions reductions have been allocated to EU-27 countries according to their respective shares in residential and commercial energy use and the energy use for heating and cooling purposes in the different countries. In addition, the Wuppertal Institute's modelling tools for household appliances and lighting and some scenario results for space heating and hot water supply have been made use of.

Table 22: Summarised results of rough estimate by countries

Maximum impact of impl. Measure	Total	**Total**	**of which is ...**						
			Boilers	**Water heaters**	**Televisions**	**Domestic refrigerators and freezers**	**Domestic washing machines and dishwashers**	**Laundry dryers**	**Household lamps**
	[Mio t CO2eq]	[kt CO2eq]	[kt CO2eq]	[kt CO2eq]	[kt CO2eq]	[kt CO2eq]	[kt CO2eq]	[kt CO2eq]	[kt CO2eq]
Austria	6	6.279	624	299	117	21	113	8	564
Belgium	8	8.235	876	420	184	28	132	20	1.214
Germany	50	50.147	5.833	2.798	1.597	245	1.168	105	10.413
Denmark	3	3.236	351	168	82	14	72	7	646
Spain	19	18.518	1.363	654	668	98	464	17	4.014
Greece	5	4.934	577	277	210	25	125	5	605
France	35	35.408	3.932	1.886	1.079	191	870	80	4.866
Finland	6	5.625	369	177	83	16	75	5	552
Italy	32	31.752	3.186	1.528	1.065	175	686	11	4.536
Ireland	3	2.573	268	129	58	10	50	7	296
Luxembourg	1	578	64	31	6	1	7	1	45
The Netherlands	11	10.689	759	364	305	49	209	32	2.354
Portugal	4	4.010	269	129	168	26	110	4	965
Sweden	7	7.409	638	306	133	28	131	11	1.455
United Kingdom	29	28.970	3.156	1.514	1.297	192	745	104	4.702
Cyprus	0	265	18	9	13	1	10	1	29
Czech Republic	6	6.233	585	280	167	25	84	7	659
Estonia	1	816	80	39	24	4	10	1	50
Hungary	5	5.091	602	289	199	25	48	6	697
Latvia	1	1.310	145	70	34	5	18	1	92
Lithuania	1	1.303	145	70	54	9	28	2	91
Malta	0	86	8	4	8	1	4	0	23
Poland	17	16.594	1.784	856	674	92	320	28	2.798
Slovak Republic	3	2.929	243	117	101	17	47	3	416
Slovenia	1	1.211	119	57	22	4	24	2	129
Bulgaria	2	2.407	210	101	95	18	58	4	412
Romania	8	8.129	850	408	131	47	176	16	849
Total	265	264.738	27.054	12.976	8.575	1.371	5.783	487	43.471

SOURCE: WUPPERTAL INSTITUTE

4.10 Beyond 2020

Unfortunately, it is not possible to present long-term saving scenarios beyond 2020. The preparatory studies only show an overview of the development until 2020. Only seven preparatory studies give estimations about the development until 2025, of which one even has a time perspective until 2030.

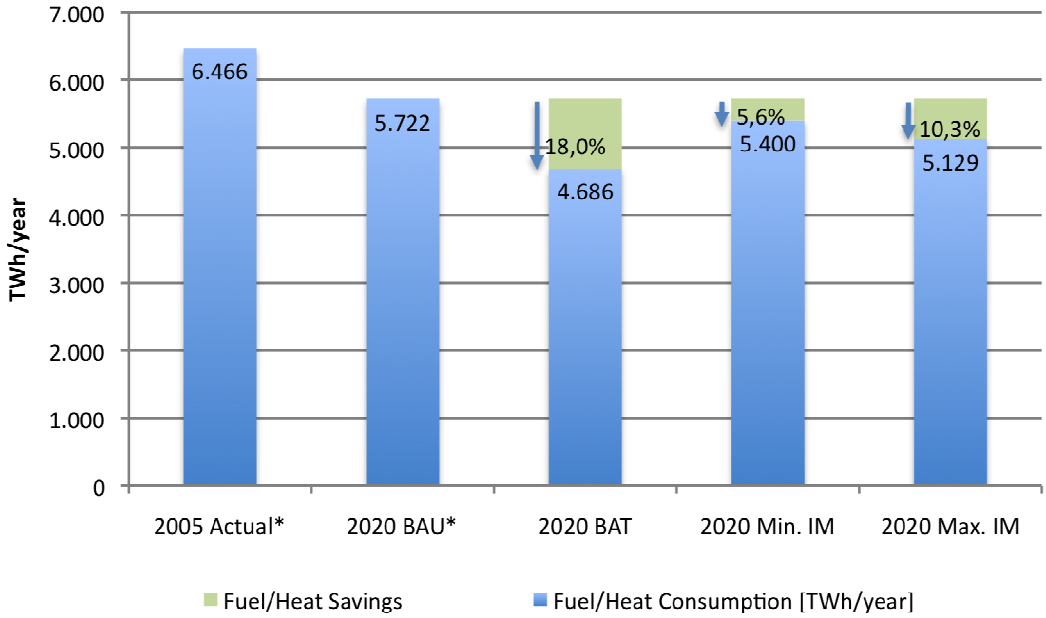
The lifetime of transformers (and of some of the solid fuel installations) is much longer than the life-times of other product groups under the Ecodesign Directive. However, there is no further data yet available that could be used for an estimate belong 2020/2030.

5. Conclusions and recommendations

The report has shown severe limits of any attempt to calculate the overall impacts of Ecodesign Directive implementing measures based on available data from preparatory studies, impact assessments and further studies. The rough estimates carried out have shown the following:

- GHG emissions in 2020 can be reduced by 211 to 265 Mio. t CO2eq compared to BAU development, if effective implementing measures are in place. This result is valid as long as it can be assumed that there will be no compensating price effect in the emissions trading system (ETS), i.e. that the energy end-use savings will not lead to any increase in specific GHG emissions per kWh electricity produced of the electricity generation plants under the ETS cap. The implementation of BAT would even lead to an overall GHG emissions reduction of 381 Mio. t CO2eq. Most of these emissions reductions will be realised in the electricity sector and will allow to set lower caps in the emissions trading scheme.
  However, if a rather unrealistic, fully compensating ETS price effect was assumed for all emissions reductions legally falling into the ETS, GHG emissions reductions would just be 85 to 114 Mio. t CO2eq in 2020. If such an effect even was assumed for all electricity savings, the GHG emissions reductions would just comprise the reductions in the heat sector, which is 19 to 34 Mio. t CO2eq in 2020.
- Although energy savings causing these emissions reductions are substantial, with figures from preparatory studies, impact assessments and furthers studies corrected for effects like double counting, rebound effects, different possibilities of market behaviour and the timeframe of implementation, and based on some own modelling by Wuppertal Institute, even with an effective implementation of ecodesign requirements, electricity consumption will still increase until 2020 compared to 2005, while heat / fuel consumption already decreases in BAU development (cf. Figure 2 and Figure 3).
- The investment into energy-efficient products will be beneficial from the user perspective as well as from the societal perspective, leading to substantial energy cost reductions and net cost savings. Energy costs of up to 127 billion Euro can be saved by 2020 compared to BAU development if the maximum of energy savings through implementing measures can be realised and with the strongly increasing energy prices assumed here. With constant energy prices at the 2005 price level, energy cost savings sum up to about 90 billion Euro in 2020 compared to BAU development.
- A large share of energy savings, emissions reductions and cost savings is expected to be realised in the field of heating and cooling of buildings. The effectiveness of measures for heating and cooling of buildings by making use of electricity and fuels will be particularly important for the overall economic impact achieved by implementing measures. Measures in the field of heating, ventilation and air conditioning sum up to about 19% to 28% of total GHG emissions reductions, but up to 60% of total energy cost savings (more than 45% of total energy cost savings assuming constant energy prices at 2005 price level), and heating and cooling measures in the residential sector sum up to about 27% to 38% of GHG emissions reductions and up to 71% of energy cost reductions (more than 57% with constant energy prices at 2005 price level) in this sector.

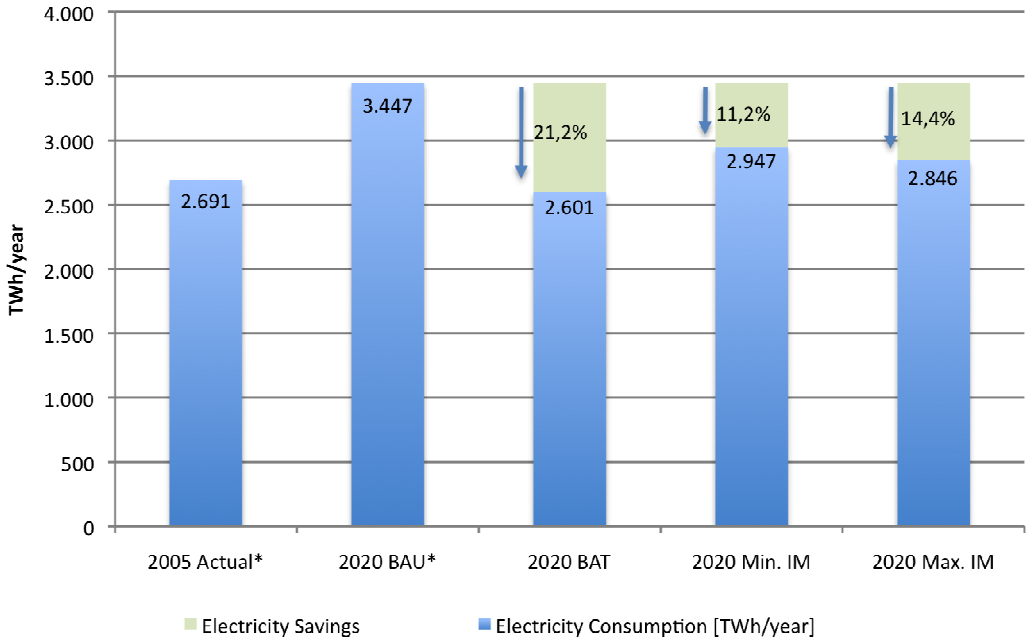
Figure 2: Final heat and fuel consumption of product groups selected under the Ecodesign Directive in different scenarios (Status: June 2010).



*PRIMES 2007: TOTAL FINAL ENERGY DEMAND OF PRIVATE HOUSEHOLDS, TERTIARY AND INDUSTRY SECTOR NOT INCLUDING TRANSPORT, BUT INCLUDING ENERGY-INTENSIVE INDUSTRY (COVERING THEREFORE MORE THAN JUST THE ECODESIGN PRODUCT GROUPS)

SOURCE: WUPPERTAL INSTITUTE

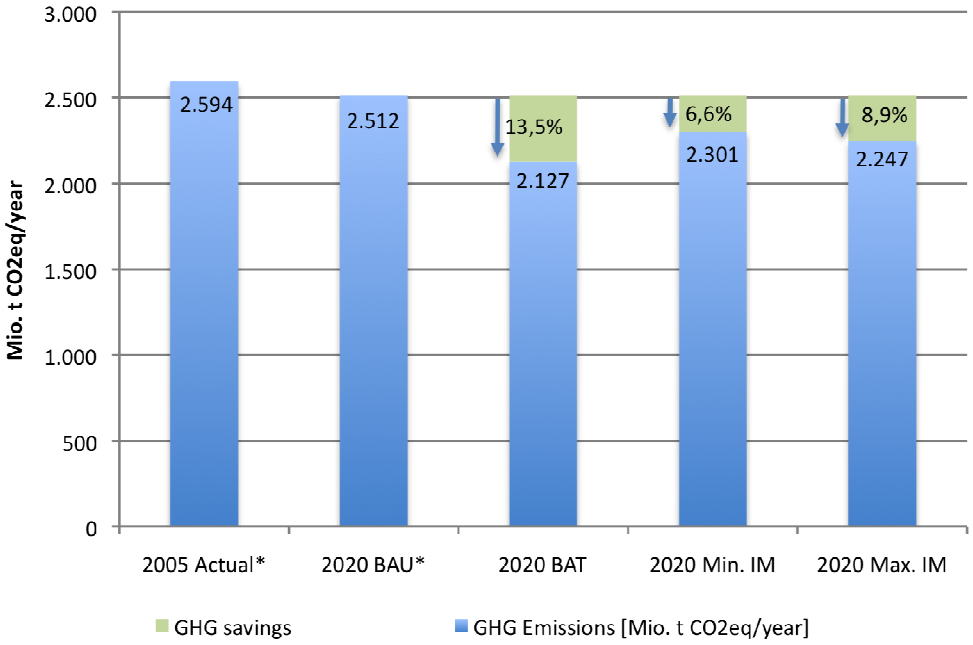
Figure 3: Final electricity consumption of product groups selected under the Ecodesign Directive in different scenarios (Status: June 2010).



*PRIMES 2007: TOTAL FINAL ENERGY DEMAND OF PRIVATE HOUSEHOLDS, TERTIARY AND INDUSTRY SECTOR NOT INCLUDING TRANSPORT, BUT INCLUDING ENERGY-INTENSIVE INDUSTRY (COVERING THEREFORE MORE THAN JUST THE ECODESIGN PRODUCT GROUPS)

SOURCE: WUPPERTAL INSTITUTE

Figure 4: Greenhouse gas emissions of product groups selected under the Ecodesign Directive in different scenarios (Status: June 2010).



*PRIMES 2007: TOTAL FINAL ENERGY DEMAND OF PRIVATE HOUSEHOLDS, TERTIARY AND INDUSTRY SECTOR NOT INCLUDING TRANSPORT, BUT INCLUDING ENERGY-INTENSIVE INDUSTRY (COVERING THEREFORE MORE THAN JUST THE ECODESIGN PRODUCT GROUPS)

SOURCE: WUPPERTAL INSTITUTE

In order to better carry out such kind of overall analysis and to better ensure consistency between the preparatory studies and impact assessments of different product groups, it is strongly recommended to add additional requirements to the methodology, which future preparatory studies and impact analyses of implementing measures should have to follow.

In particular, in addition to the EcoReport spreadsheet and VHK methodology for preparatory studies (VHK 2005), common tables for every product group should be required, which should inform about the following parameters and results of calculation:

Important assumptions of scenario calculations

- Replacement rates of the different product subgroups
- Growth of stock of the different product subgroups
- Investment, installation and maintenance costs assumed for scenario calculations
- Energy prices
- Discount rate
- Start and tiers of implementation of energy efficiency regulation / measures
- Rebound effects and other influencing factors.

Important energy, environmental and economic results for the following scenarios:

- freeze, i.e. not changing the energy efficiency of the market
- static BAT potential (ficticious replacement at once by BAT)
- dynamic BAU, BAT and LLCC scenarios
- policy and measure (PAM) options proposed.

In order to produce and present comparable results for such a table, there should be a common and transparent way of modelling stock and market and for the scenario calculations. Up to now, several preparatory studies have difficulties in carefully distinguishing between modelling of the market and of the stock. Therefore, the methodology has to be better explained and a stock modelling tool to be provided for future preparatory studies.

Only with such additional requirements, a comprehensive, sufficiently grounded, consistent overall impact assessment will be possible. This is particularly true for the newer, more specific lots, for which there are not so many studies on energy efficiency and further environmental aspects available, which can be used for comparison with results from preparatory studies.

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Appendix

ENER: Simple set-top boxes
(Regulation entered into force on 25th February 2009)

Scope

Simple set-top box (SSTB) – means a stand-alone device. It has the primary function of converting standard definition (SD) or high definition (HD) digital broadcast signals to analogue broadcast signals for television or radio and has no conditional access function and no removable media; it can be equipped with time-shift and recording functions (integrated hard disk), converse HD signals to HD or SD video output and a second tuner.

State of Ecodesign process

COMMISSION REGULATION (EC) No 107/2009 of 4 February 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for simple set-top boxes [http://ec.europa.eu/energy/efficiency/ecodesign/legislation_en.htm], published 5th Feb. 2009 in the Official Journal of the European Union L 36/8;
Entry into force: 25th February 2009;
Tiers; First tier: 25th February 2010; Second tier: 25th February 2012;
Revision 5 years after entry into force (2014)

Ecodesign requirements

Specific power consumption limits for different power modes; information requirements with regard to technical documentation.

Impacts

Table 23: Quantitative assessment of impact in year 2020 in EU-27 compared to BAU development - Simple set top boxes

Impact category	Unit	Estimate by impact assessment / preparatory study	Rough estimate of impacts as expected by Wuppertal Institute (with corrections as explained in Chapter 4.3)				ESD Potential Study [FhG-ISI et al. 2009]		
		Proposed Option / Regulation	Dynamic BAT 2020	Implementing Measure		Data base / Correction	LPI	HPI	Tech-nical
				Min.	Max.				
Heat / Fuel savings	TWh					Impact Assessment (2015 instead of 2020); Preparatory study for BAT			
Electricity savings	TWh	9	7.6	7.2	7.2		0.8	0.8	1.0
GHG emissions reductions	Mio. t CO2eq	3.1	2.9	2.8	2.8		0.3	0.3	0.4
Energy cost savings	Mio. Euro	896.9			731.0				
Net cost savings	Mio. Euro				731.0				

LPI: LOW POLICY INTENSITY; HPI: HIGH POLICY INTENSITY; TECHNICAL: TECHNICAL POTENTIAL

MIN. = MINIMUM (MAX. = MAXIMUM) OF POSSIBLE EFFECTS OF AN IMPLEMENTING MEASURE

SOURCE: WUPPERTAL INSTITUTE

Min/Max values are the same, because it is not expected that there could be significant variations in implementation and respective consumer reactions.

The significantly higher savings compared to the ESD potential study are due to stronger increase in sales expected in the preparatory study.

ENER1: Boilers and combiboilers

Scope

The requirements for boilers include CH boilers for gas, oil and electricity with a power of 3,6 to 350 kW. In the scope of the boiler and combiboiler study are all CH (combi) boilers which use one of the following heat generation processes:
- combustion of gaseous and/or liquid fossil fuels
- use of the Joule effect in electric resistance heating elements
- capturing solar thermal energy
- capturing ambient heat, including but not limited to transformation processes to bring the heat to a higher energy level (e.g. heat pumps)

State of Ecodesign process

The minimum performance and labelling requirements for boilers were discussed during the Consultation Forum the 24-25 June 2009.

Ecodesign requirements

Some of the requirements for CH boilers proposed are:
Minimum performance of overall specific efficiency for boilers with an output power of less than 70 kW shall be 56% from 2011 and 76% from 2013.
For Boilers with an output power of more than 70 kW the requirement is 56% from 2011 and 96% from 2013.
Maximum NOx-emissions shall not exceed 20 ppm from 2013.

Impacts

Table 24: Quantitative assessment of impact in year 2020 in EU-27 compared to BAU development - Boilers and combiboilers

Impact category	Unit	Estimate by impact assessment / preparatory study	Rough estimate of impacts as expected by Wuppertal Institute (with corrections as explained in Chapter 4.3)				ESD Potential Study [FhG-ISI et al. 2009]		
		Proposed Option / Regulation	Dynamic BAT 2020	Implementing Measure		Data base / Correction	LPI	HPI	Tech-nical
				Min.	Max.				
Heat / Fuel savings	TWh	*2233 PJ*	665.7	183.7	323.3	Preparatory study, checked by own modelling	93.2	93.2	139.5
Electricity savings	TWh		21.9	12.4	21.9		11.5	11.5	17.2
GHG emissions reductions	Mio. t CO2eq	128	46,8	15.4	27.1		9.8	9.8	14.7
Energy cost savings	Mio. Euro				38,140.3				
Net cost savings	Mio. Euro								

LPI: LOW POLICY INTENSITY; HPI: HIGH POLICY INTENSITY; TECHNICAL: TECHNICAL POTENTIAL

MIN. = MINIMUM (MAX. = MAXIMUM) OF POSSIBLE EFFECTS OF AN IMPLEMENTING MEASURE

SOURCE: WUPPERTAL INSTITUTE

Impacts will strongly depend on the design of the implementing measure. However, the regulation of products (boilers, or their components) alone will not be sufficient to realise the full energy savings potential. Therefore, the combination with other policies and measures, particularly the Energy Performance of Buildings Directive and its implementation on national level, will be important to achieve a larger impact.

ENER2: Water heaters

Scope

A water heater is defined as a product connected to an external supply of drinking water to generate heat and transfer this water to desired temperature levels. The hot water is typically used for cooking, cleaning, bathing and space heating (and several items in industry).

State of Ecodesign process

The minimum performance and labelling requirements for water heaters were discussed in one proposal in Consultation Forum the 29 February 2008 and a revised proposal for water heaters was submitted in September 2008.

Ecodesign requirements

Some of the requirements for water heaters proposed are:
From 2013: minimum performance of Class B level (for M, L and XL loads).
From 2015: minimum performance of Class A level for all loads (with some exceptions for replacements).

Impacts

Table 25: Quantitative assessment of impact in year 2020 in EU-27 compared to BAU development - Water heaters

Impact category	Unit	Estimate by impact assessment / preparatory study	Rough estimate of impacts as expected by Wuppertal Institute (with corrections as explained in Chapter 4.3)				ESD Potential Study [FhG-ISI et al. 2009]		
		Proposed Option / Regulation	Dynamic BAT 2020	Implementing Measure		Data base / Correction	LPI	HPI	Tech-nical
				Min.	Max.				
Heat / Fuel savings	TWh	*1,226 PJ*	161.4	82.3	161.4	Preparatory Study, checked by own modelling	18.9	27.4	51.5
Electricity savings	TWh		9.5	4.9	9.5		2.0	2.9	5.6
GHG emissions reductions	Mio. t CO2eq	71	13.0	6.6	13.0		1.9	2.7	5.1
Energy cost savings	Mio. Euro				18,898.0				
Net cost savings	Mio. Euro								

LPI: LOW POLICY INTENSITY; HPI: HIGH POLICY INTENSITY; TECHNICAL: TECHNICAL POTENTIAL

MIN. = MINIMUM (MAX. = MAXIMUM) OF POSSIBLE EFFECTS OF AN IMPLEMENTING MEASURE

SOURCE: WUPPERTAL INSTITUTE

ENER3: Computers and monitors

Scope

The proposed requirements cover desktops, notebook computers, thin clients and workstations (but not servers) and set the Energy Star specifications as minimum performance requirements. According to the new proposal, servers are also included in the scope.

State of Ecodesign process

Consultation Forum was held on 9 October 2009 and a new draft proposal was published in December 2009.

Ecodesign requirements

Energy Star 5.0 is proposed as the mandatory level one year after the regulation has come into force The proposal includes requirements for off- and sleep mode power, internal power supply efficiency and power management enabling.

Impacts

Table 26: Quantitative assessment of impact in year 2020 in EU-27 compared to BAU development - Computers and monitors

Impact category	Unit	Estimate by impact assessment / preparatory study	Rough estimate of impacts as expected by Wuppertal Institute (with corrections as explained in Chapter 4.3)				ESD Potential Study [FhG-ISI et al. 2009]		
		Proposed Option / Regulation	Dynamic BAT 2020	Implementing Measure		Data base / Correction	LPI	HPI	Tech-nical
				Min.	Max.				
Heat / Fuel savings	TWh					Preparatory study			
Electricity savings	TWh	9.85	24.3	5.5	7.6		4.7	4.7	4.7
GHG emissions reductions	Mio. t CO2eq	6.51	9.3	2.1	2.9		1.8	1.8	1.8
Energy cost savings	Mio. Euro	1,002.73			773.2				
Net cost savings	Mio. Euro								

LPI: LOW POLICY INTENSITY; HPI: HIGH POLICY INTENSITY; TECHNICAL: TECHNICAL POTENTIAL

MIN. = MINIMUM (MAX. = MAXIMUM) OF POSSIBLE EFFECTS OF AN IMPLEMENTING MEASURE

SOURCE: WUPPERTAL INSTITUTE

ENER4: Imaging equipment

Scope

The scope covers printers, copiers, faxes and multifunctional devices (MFDs).

State of Ecodesign process

It was found out that no sufficient evidence was available to develop policy proposals at this stage and that some of the environmental impacts are already addressed under the Energy Star Programme. A voluntary agreement has therefore been suggested, although the Commission states that Regulation would also be taken into consideration: Industry voluntary agreement to improve the environmental performance of imaging equipment placed on the European market (Draft) from 19 February 2010.

The scope of the voluntary agreement is based on the Preparatory Study within the framework of the Ecodesign Directive and linked with Energy Star. Product categories are copiers, multifunction devices, printers and fax machines. Market technologies are Electrophotography (EP), Inkjet (IJ) and solid ink (SI). The VA is limited to household and office equipment meaning: BW Standard size format products with maximum speed < 66 A4 images per minute and Colour Standard size format products with maximum speed <51 A4 images per minute

Ecodesign requirements

According to the proposed voluntary agreement, the signatories would commit to have 50% of their imaging equipment in compliance with the Energy Star V1.1 Energy and Duplex requirements in January 2011. The agreement would be revised in January 2012.

Impacts

Table 27: Quantitative assessment of impact in year 2020 in EU-27 compared to BAU development - Imaging equipment

Impact category	Unit	Estimate by impact assessment / preparatory study	Rough estimate of impacts as expected by Wuppertal Institute (with corrections as explained in Chapter 4.3)				ESD Potential Study [FhG-ISI et al. 2009]		
		Proposed Option / Regulation	Dynamic BAT 2020	Implementing Measure		Data base / Correction	LPI	HPI	Tech-nical
				Min.	Max.				
Heat / Fuel savings	TWh					Preparatory study			
Electricity savings	TWh	3.2	2.3	2.3	2.3		2.7	2.7	2.7
GHG emissions reductions	Mio. t CO2eq	1.11	0.9	0.9	0.9		1.0	1.0	1.0
Energy cost savings	Mio. Euro	326			236.2				
Net cost savings	Mio. Euro								

LPI: LOW POLICY INTENSITY; HPI: HIGH POLICY INTENSITY; TECHNICAL: TECHNICAL POTENTIAL

MIN. = MINIMUM (MAX. = MAXIMUM) OF POSSIBLE EFFECTS OF AN IMPLEMENTING MEASURE

SOURCE: WUPPERTAL INSTITUTE

Min/Max values are the same, because it is not expected that there could be significant variations in implementation and respective consumer reactions.

ENER5: Consumer electronics: TV (Regulation entered into force on 12th August 2009)

Scope

In the scope are television sets and television monitors.

State of Ecodesign process

COMMISSION REGULATION (EC) No 642/2009 of 22 July 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for televisions [http://ec.europa.eu/energy/efficiency/ecodesign/legislation_en.htm], published 23 July 2009 in the Official Journal of the European Union L191/42;
Entry into force: 12 August 2009;
Tiers: First tier: 20 August 2010, Second tier: 1 April 2012;
Revision: 3 years after entry into force

Ecodesign requirements

The requirements for televisions are introduced in two levels:
From 2010: The minimum energy performance requirements are set so that all TVs must be more efficient than today's current sector average.
From April 2012: More demanding standards are introduced: Standard television sets must be 20% more efficient and full-HD sets to be 30% more efficient than the current sector average.
The proposal of the new energy label was rejected by the European Parliament in May 2009, which obliges the Commission to table new proposals for updating the A to G efficiency rating system.

Impacts

Table 28: Quantitative assessment of impact in year 2020 in EU-27 compared to BAU development - Consumer electronics: TV

Impact category	Unit	Estimate by impact assessment / preparatory study	Rough estimate of impacts as expected by Wuppertal Institute (with corrections as explained in Chapter 4.3)				ESD Potential Study [FhG-ISI et al. 2009]		
		Proposed Option / Regulation	Dynamic BAT 2020	Implementing Measure		Data base / Correction	LPI	HPI	Tech-nical
				Min.	Max.				
Heat / Fuel savings	TWh					Impact Assessment; Preparatory study for BAT			
Electricity savings	TWh	28	49.3	22.3	22.3		2.8	2.8	11.0
GHG emissions reductions	Mio. t CO2eq	9.72	18.9	8.6	8.6		1.1	1.1	4.2
Energy cost savings	Mio. Euro	2,850			2,273.3				
Net cost savings	Mio. Euro				2,265.4				

LPI: LOW POLICY INTENSITY; HPI: HIGH POLICY INTENSITY; TECHNICAL: TECHNICAL POTENTIAL

MIN. = MINIMUM (MAX. = MAXIMUM) OF POSSIBLE EFFECTS OF AN IMPLEMENTING MEASURE

SOURCE: WUPPERTAL INSTITUTE

Min/Max values are the same, because it is not expected that there could be significant variations in implementation and respective consumer reactions.

ENER6: Standby and off mode (Regulation entered into force on 7th January 2009)

Scope

The measure is horizontal i.e. the requirements apply to all products - even those for which specific requirements are not yet defined.
Annex I of the Regulation published a list of energy-using products covered by ecodesign requirements: Household appliances, information technology equipment intended primarily for use in the domestic environment, consumer equipment and toys, leisure and sports equipment.

State of Ecodesign process

COMMISSION REGULATION (EC) No 1275/2008 of 17 December 2008 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for standby and off mode electric power consumption of electrical and electronic household and office equipment [http://ec.europa.eu/energy/efficiency/ecodesign/legislation_en.htm], published 18 December 2008 in the Official Journal of the European Union L 339/45;
Entry into force: 07 January 2009;
Tiers: First tier: 07 January 2010, Second tier: 07 January 2013;
Revision: 6 years after entry into force

Ecodesign requirements

The main requirements are:
Max 1 W power for passive standby and off-mode starting in 2010
Max 0.5 W from 2013

Impacts

Table 29: Quantitative assessment of impact in year 2020 in EU-27 compared to BAU development - Standby and off-mode losses

Impact category	Unit	Estimate by impact assessment / preparatory study	Rough estimate of impacts as expected by Wuppertal Institute (with corrections as explained in Chapter 4.3)				ESD Potential Study [FhG-ISI et al. 2009]		
		Proposed Option / Regulation	Dynamic BAT 2020	Implementing Measure		Data base / Correction	LPI	HPI	Technical
				Min.	Max.				
Heat / Fuel savings	TWh					Impact Assessment			
Electricity savings	TWh	35	27.9	27.9	27.9		Included in calculations for specific product groups		
GHG emissions reductions	Mio. t CO2eq	14.15	10.7	10.7	10.7				
Energy cost savings	Mio. Euro	3,563			2,841.6				
Net cost savings	Mio. Euro				1,369.2				

LPI: LOW POLICY INTENSITY; HPI: HIGH POLICY INTENSITY; TECHNICAL: TECHNICAL POTENTIAL

MIN. = MINIMUM (MAX. = MAXIMUM) OF POSSIBLE EFFECTS OF AN IMPLEMENTING MEASURE

SOURCE: WUPPERTAL INSTITUTE

Min/Max values are the same, because it is not expected that there could be significant variations in implementation and respective consumer reactions.

ENER7: External power supplies and battery chargers (Regulation entered into force on 27th April 2009)

Scope

The requirements for external power supplies include most stand-alone AC/AC and AC/DC devices with a rated power up to 250 Watts

State of Ecodesign process

COMMISSION REGULATION (EC) No 278/2009 of 6 May 2010 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for no-load condition electric power consumption and average active efficiency of external power supplies [http://ec.europa.eu/energy/efficiency/ecodesign/legislation_en.htm], published 07 May 2010 in the Official Journal of the European Union L 93/3.
Entry into force: 27 April 2009;
Tiers: First tier: 27 May 2010, Second tier: 27 April 2011;
Revision: 4 years after entry into force

Ecodesign requirements

In the first stage the no-load power consumption shall not exceed 0,50 Watt

Impacts

Table 30: Quantitative assessment of impact in year 2020 in EU-27 compared to BAU development - External power supplies and battery charges

Impact category	Unit	Estimate by impact assessment / preparatory study	Rough estimate of impacts as expected by Wuppertal Institute (with corrections as explained in Chapter 4.3)				ESD Potential Study [FhG-ISI et al. 2009]		
		Proposed Option / Regulation	Dynamic BAT 2020	Implementing Measure		Data base / Correction	LPI	HPI	Technical
				Min.	Max.				
Heat / Fuel savings	TWh					Impact Assessment			
Electricity savings	TWh	9	7.2	7.2	7.2				
GHG emissions reductions	Mio. t CO2eq	3.6	2.8	2.8	2.8				
Energy cost savings	Mio. Euro	916			730.7				
Net cost savings	Mio. Euro				353.1				

LPI: LOW POLICY INTENSITY; HPI: HIGH POLICY INTENSITY; TECHNICAL: TECHNICAL POTENTIAL

MIN. = MINIMUM (MAX. = MAXIMUM) OF POSSIBLE EFFECTS OF AN IMPLEMENTING MEASURE

SOURCE: WUPPERTAL INSTITUTE

Min/Max values are equal, as significant variations in implementation and respective consumer reactions are not to be expected.

ENER8/9: Tertiary sector lighting (Regulation entered into force on 13th April 2009)

Scope

The legislation sets requirements for linear and compact fluorescent lamps without integrated ballast, for high intensity discharge lamps, and for ballasts and luminaires able to operate such lamps. However, there are several limitations. In addition, no reflector lamps are covered since they are to be covered under a separate piece of legislation due late 2009.

State of Ecodesign process

COMMISSION REGULATION (EC) No 245/2009 of 18 March 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for fluorescent lamps without integrated ballast, for high intensity discharge lamps, and for ballasts and luminaires able to operate such lamps, and repealing Directive 2000/55/EC of the European Parliament and of the Council [http://ec.europa.eu/energy/efficiency/ecodesign/legislation_en.htm],], published 19 March 2009 in the Official Journal of the European Union L 76/17;
Entry into force: 13. April 2009;
Tiers: First tier: 13.April 2010, Second tier: 13. April 2012, third tier: 13. April: 2017;
Revision: 5 years after entry into force
ELC and CELMA have submitted a joint request for amending Regulation 245/2009. The proposal was discussed in Consultation Forum the 15th September 2009.

Ecodesign requirements

Some of the requirements are:
"Fat" linear T12 (and T10) halophosphate lamps will be banned from 2012 with the exception of lamps for special purposes.
Minimum requirements for performance of T8 and T5 linear lamps. This includes that T8 halophosphate lamps will be banned from 2010.
Requirements on minimum lumen maintenance levels will be introduced.
From 2017 all fluroescent lamps must be designed to work with an electronic ballast.
From 2012 new luminaires must be sold with electronic ballasts and from 2017 magnetic ballasts will not be permitted even for replacement in existing luminaires.
Minimum performance requirements for HID lamps, which means phasing out of HPM lamps, the largest wattages are phased out first.
90% of the HPS lamps should have a lifetime of more than 16000 hours.
Metal halogen lamps should have a minimum lifetime of 12000 h for 80% (frosted) and 90% (clear)
Requirements of directional light sources for street lighting luminaires (not only HID) to reduce light pollution.
Minimum performance requirements for all HID lamps to minimize mercury content.

Impacts

Table 31: Quantitative assessment of impact in year 2020 in EU-27 compared to BAU development - Tertiary sector lighting

Impact category	Unit	Estimate by impact assessment / preparatory study	Rough estimate of impacts as expected by Wuppertal Institute (with corrections as explained in Chapter 4.3)				ESD Potential Study [FhG-ISI et al. 2009]		
		Proposed Option / Regulation	Dynamic BAT 2020	Implementing Measure		Data base / Correction	LPI	HPI	Tech-nical
				Min.	Max.				
Heat / Fuel savings	TWh					Impact Assessment; Preparatory study for BAT			
Electricity savings	TWh	38	81.4	32.1	32.1		38.5	38.5	46.7
GHG emissions reductions	Mio. t CO2eq	15.2	31.2	12.3	12.3		14.8	14.8	17.9
Energy cost savings	Mio. Euro	3,868			3,268.9				
Net cost savings	Mio. Euro				1,667.1				

LPI: LOW POLICY INTENSITY; HPI: HIGH POLICY INTENSITY; TECHNICAL: TECHNICAL POTENTIAL

MIN. = MINIMUM (MAX. = MAXIMUM) OF POSSIBLE EFFECTS OF AN IMPLEMENTING MEASURE

SOURCE: WUPPERTAL INSTITUTE

Min/Max values are equal, as significant variations in implementation and respective consumer reactions are not to be expected.

ENER10: Comfort fans

Scope

Comfort fan: Air-moving device intended to locally increase the flow rate of ambient air aiming to increase the personal cooling comfort of persons located within its range. Includes the following fans with electric power input ≤125 W: Tower fans, ceiling Fans and other comfort fans.
Not included are ventilation fans for (ducted) air transport between an indoor space and outdoors and/or between one indoor space and another, aiming at maintaining indoor air quality at a desired level.

State of Ecodesign process

A meeting in Consultation Forum the 22 June 2009 treated the working document on possible ecodesign measures on room air conditioning appliances, local air coolers and comfort fans. A Consultation Forum of 23 April 2010 dealt with Ecodesign and Labelling draft regulations for Household Air conditioning appliances and comfort fans.

Ecodesign requirements

Proposed:
Maximum specific fan power requirement entering into force by 01.01.2012 : 11-41 W/1000m^3/h.
Standby / off-mode requirements based on Ecodesign requirements of Commission Regulation 1275/2008/EC but with a two year delay: Off mode power consumption: 1.0 W (01.01.2012), 0.5 W (01.01.2015) Standby power consumption (reactivation function only): 1.0 W (01.01.2012), 0.5 W (01.01.2015) Standby power consumption (incl. information or status display): 2.0 W (01.01.2012), 1.0 W (01.01.2015) Power management from 01.01.2005 onwards.
Maximum acceptable noise requirement entering into force by 01.01.2012: 50-75 dB(A)

Impacts

Table 32: Quantitative assessment of impact in year 2020 in EU-27 compared to BAU development - Comfort fans

Impact category	Unit	Estimate by impact assessment / preparatory study	Rough estimate of impacts as expected by Wuppertal Institute (with corrections as explained in Chapter 4.3)				ESD Potential Study [FhG-ISI et al. 2009]		
		Proposed Option / Regulation	Dynamic BAT 2020	Implementing Measure		Data base / Correction	LPI	HPI	Tech-nical
				Min.	Max.				
Heat / Fuel savings	TWh					Preparatory study			
Electricity savings	TWh		1.8	1.1	1.8				
GHG emissions reductions	Mio. t CO2eq	1.65	0.7	0.4	0.7				
Energy cost savings	Mio. Euro	203			183.8				
Net cost savings	Mio. Euro								

LPI: LOW POLICY INTENSITY; HPI: HIGH POLICY INTENSITY; TECHNICAL: TECHNICAL POTENTIAL

MIN. = MINIMUM (MAX. = MAXIMUM) OF POSSIBLE EFFECTS OF AN IMPLEMENTING MEASURE

SOURCE: WUPPERTAL INSTITUTE

Min/Max values are equal, as significant variations in implementation and respective consumer reactions are not to be expected.

ENER10: Residential ventilation

Scope

- Fans for decentralized (local) mechanical ventilation with or without HR: Roof fans (Elec power < 125 W), Window fans (Elec power < 125 W), Wall fans (Elec power < 125 W), Hood fans (remaining in the residential domain), 'Decentralised' ventilation includes 'local ventilation' and kitchen ventilation by hoods
- Fans for central ventilation serving various rooms, which can be differentiated between fans serving one individual house (Elec power < 125 W) treated here and fans serving various dwellings in the same collective building (see lot 11); those products are also called encased fans and may be sold alone or as packages with the extracts and/or supply grilles, the roof outlets and/or inlets: Extract fan, including assistance fans in hybrid ventilation; Supply fan; Extract and supply (balanced or double flow); Extract and supply (balanced or double flow) with heat recovery.

State of Ecodesign process

A meeting in Consultation Forum on 22 June 2009 treated the working document on possible ecodesign measures on room air conditioning appliances (RAC), local air coolers and comfort fans. A Consultation Forum of 23 April 2010 dealt with Ecodesign and Labelling draft regulations for Household Air conditioning appliances and comfort fans.

Ecodesign requirements

Two scenarios proposed by preparatory study:
Scenario 1:
- Nameplate should inform about electrical demand (P) at best efficiency point at full load, EEI at Full Load, EEI at Part Load (weighted average of 25%-50%-75%-100%).
- Stand-by requirements like in Lot 6.
- MEPS at full load: 0.1176*P for local ventilation; 0.0400*P for hood and 0.1600*P for central ventilation.
- Labelling based on EEI at part load, with specific design proposed.

Scenario 2 leading in the end to LLCC:
- First steps as in scenario 1.
- Additional requirement: MEPS at part load: 0.1176*P for local ventilation; 0.0400*P for hood and 0.1600*P for central ventilation.

Impacts

Table 33: Quantitative assessment of impact in year 2020 in EU-27 compared to BAU development - Residential ventilation

Impact category	Unit	Estimate by impact assessment / preparatory study	Rough estimate of impacts as expected by Wuppertal Institute (with corrections as explained in Chapter 4.3)				ESD Potential Study [FhG-ISI et al. 2009]		
		Proposed Option / Regulation	Dynamic BAT 2020	Implementing Measure		Data base / Correction	LPI	HPI	Tech-nical
				Min.	Max.				
Heat / Fuel savings	TWh					Preparatory study			
Electricity savings	TWh	1.15	1.2	0.4	1.2				
GHG emissions reductions	Mio. t CO2eq	0.5	0.5	0.2	0.5				
Energy cost savings	Mio. Euro	117			126.2				
Net cost savings	Mio. Euro								

LPI: LOW POLICY INTENSITY; HPI: HIGH POLICY INTENSITY; TECHNICAL: TECHNICAL POTENTIAL

MIN. = MINIMUM (MAX. = MAXIMUM) OF POSSIBLE EFFECTS OF AN IMPLEMENTING MEASURE

SOURCE: WUPPERTAL INSTITUTE

ENER10: Air conditioners

Scope

In the scope of air conditioners are room air conditioners (RAC) (with 0.75 kW -12 kW cooling output power) and local air coolers (LAC) (with 250 W - 2.2 kW cooling output power; larger LAC ≤ 12 kW is a RAC)

State of Ecodesign process

A meeting in Consultation Forum the 22 June treated the working document on possible ecodesign measures on room air conditioning appliances (RAC), local air coolers and comfort fans. A Consultation Forum of 23 April 2010 dealt with Ecodesign and Labelling draft regulations for Household Air conditioning appliances and comfort fans.

Ecodesign requirements

Energy performance requirements proposed in two tiers (according to the working document): 2012 and 2014 with minimum energy efficiency performance standards. The working document also presented standby/off-mode requirements and energy labelling and information requirements.

Impacts

Table 34: Quantitative assessment of impact in year 2020 in EU-27 compared to BAU development - Room air conditioners

Impact category	Unit	Estimate by impact assessment / preparatory study	Rough estimate of impacts as expected by Wuppertal Institute				ESD Potential Study [FhG-ISI et al. 2009]		
		Proposed Option / Regulation	Dynamic BAT 2020	Implementing Measure		Data base / Correction	LPI	HPI	Tech-nical
				Min.	Max.				
Heat / Fuel savings	TWh					Preparatory study			
Electricity savings	TWh	31	24.7	10.1	10.1		21.0	21.0	21.0
GHG emissions reductions	Mio. t CO2eq	4	9.5	3.9	9.5		8.1	8.1	8.1
Energy cost savings	Mio. Euro	3,156			2,513.0				
Net cost savings	Mio. Euro								

LPI: LOW POLICY INTENSITY; HPI: HIGH POLICY INTENSITY; TECHNICAL: TECHNICAL POTENTIAL

MIN. = MINIMUM (MAX. = MAXIMUM) OF POSSIBLE EFFECTS OF AN IMPLEMENTING MEASURE

SOURCE: WUPPERTAL INSTITUTE

ENER11: Motors
(Regulation entered into force on 12th August 2009)

Scope

'Motor' means an electric single speed, three-phase 50 Hz or 50/60 Hz, squirrel cage induction motor that has 2 to 6 poles, has a rated voltage of U N up to 1 000 V, has a rated output P N between 0,75 kW and 375 kW, is rated on the basis of continuous duty operation.

Some exclusions.

State of Ecodesign process

COMMISSION REGULATION (EC) No 640/2009 of 22 July 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for electric motors, http://ec.europa.eu/energy/efficiency/ecodesign/legislation_en.htm, published 23rd July 2009 in the Official Journal of the European Union L 191/26.
Entry into force: 12 August 2009
Tiers: 16 June 2011, 1 January 2015, 1 January 2017

Ecodesign requirements

From 16 June 2011, motors shall not be less efficient than the IE2 efficiency level.

From 1 January 2015, motors with a rated output of 7,5-375 kW shall not be less efficient than the IE3 efficiency level, or meet the IE2 efficiency level, and be equipped with a variable speed drive.

From 1 January 2017, all motors with a rated output of 0,75-375 kW shall not be less efficient than the IE3 efficiency level, or meet the IE2 efficiency level, and be equipped with a variable speed drive.

Moreover, there are information requirements and benchmarks.

Impacts

Table 35: Quantitative assessment of impact in year 2020 in EU-27 compared to BAU development - Motors

Impact category	Unit	Estimate by impact assessment / preparatory study	Rough estimate of impacts as expected by Wuppertal Institute (with corrections as explained in Chapter 4.3)				ESD Potential Study [FhG-ISI et al. 2009]		
		Proposed Option / Regulation	Dynamic BAT 2020	Implementing Measure		Data base / Correction	LPI	HPI	Tech-nical
				Min.	Max.				
Heat / Fuel savings	TWh					Impact Assessment; Preparatory Study: BAT			
Electricity savings	TWh	135	96.4	83.4	83.4		181.7	191.3	202.1
GHG emissions reductions	Mio. t CO2eq	64	37.0	32.0	32.0		69.8	73.5	77.6
Energy cost savings	Mio. Euro	13,743			8,494.5				
Net cost savings	Mio. Euro				8,017.6				

LPI: LOW POLICY INTENSITY; HPI: HIGH POLICY INTENSITY; TECHNICAL: TECHNICAL POTENTIAL

OWN ESTIMATE CONSIDERS OVERLAPS WITH OTHER LOTS, WHICH ARE ALREADY SUBTRACTED.

MIN. = MINIMUM (MAX. = MAXIMUM) OF POSSIBLE EFFECTS OF AN IMPLEMENTING MEASURE

SOURCE: WUPPERTAL INSTITUTE

Min/Max values are equal, as significant variations in implementation and respective consumer reactions are not to be expected.

It should be noted that the preparatory study contractors have assumed that there will be no increase in energy efficiency of motors in BAU scenario between 2006 and 2020 ("freeze" scenario). This assumption is questionable. However, since no more realistic other BAU scenario assumptions have been found in literature, this assumption has been taken over here for the purpose of this estimate.

ENER11: Fans

Scope

The fans falling within the scope of the measurement include power range 125W to 500kW. A fan is here defined as a rotary bladed machine that is used to maintain a flow of a gas (typically air) and which is driven by an electric motor.

State of Ecodesign process

The proposed measure for ventilation fans was discussed in Consultation Forum the 27 May 2008.

Ecodesign requirements

It includes proposed requirements (efficiency grades) for levels for fans of different categories, valid from 2012 and 2015.
A review of the measure shall be presented depending on the technological development and ventilation fan markets not later than 5 years after it has entered into force.

Impacts

Table 36: Quantitative assessment of impact in year 2020 in EU-27 compared to BAU development - Fans

Impact category	Unit	Estimate by impact assessment / preparatory study	Rough estimate of impacts as expected by Wuppertal Institute (with corrections as explained in Chapter 4.3)				ESD Potential Study [FhG-ISI et al. 2009]		
		Proposed Option / Regulation	Dynamic BAT 2020	Implementing Measure		Data base / Correction	LPI	HPI	Tech-nical
				Min.	Max.				
Heat / Fuel savings	TWh					Working Document; Preparatory Study for BAT			
Electricity savings	TWh	54	76.0	34.7	47.7				
GHG emissions reductions	Mio. t CO2eq	25	29.2	13.3	18.3				
Energy cost savings	Mio. Euro	5,497			4,854.0				
Net cost savings	Mio. Euro								

LPI: LOW POLICY INTENSITY; HPI: HIGH POLICY INTENSITY; TECHNICAL: TECHNICAL POTENTIAL

MIN. = MINIMUM (MAX. = MAXIMUM) OF POSSIBLE EFFECTS OF AN IMPLEMENTING MEASURE

SOURCE: WUPPERTAL INSTITUTE

ENER11: Circulators
(Regulation entered into force on 12th August 2009)

Scope

The proposed requirement defines a circulator as a glandless impeller pump up to 2500W used primarily for central heating systems. A standalone circulator is a circulator separate from the boiler, glandless means that the circulator has the shaft of the motor directly coupled to the impeller (the motor is also immersed in the pumped medium).

State of Ecodesign process

COMMISSION REGULATION (EC) No 641/2009 of 22 July 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for glandless standalone circulators and glandless circulators integrated in products Council [http://ec.europa.eu/energy/efficiency/ecodesign/legislation_en.htm], published 23. July 2009 in the Official Journal of the European Union L 191/35;
Entry into force: 12. August 2009;
Tiers: First tier: 1 January 2013, Second tier: 1 August 2015;
Revision: The Commission shall review the methodology for calculating the energy efficiency index, set out in Annex II, point 2 to the Regulation, for glandless circulators integrated in products before 1 January 2012. It shall review the Regulation before 1 January 2017, in the light of technological progress. The review will include the assessment of design options that can facilitate re-use and recycling.

Ecodesign requirements

Some of the requirements are:
From 2013: minimum energy performance of EEI 0,27 (with some exceptions)
From 2015: minimum energy performance of EEI 0,23

Impacts

Table 37: Quantitative assessment of impact in year 2020 in EU-27 compared to BAU development - Circulators

Impact category	Unit	Estimate by impact assessment / preparatory study	Rough estimate of impacts as expected by Wuppertal Institute (with corrections as explained in Chapter 4.3)				ESD Potential Study [FhG-ISI et al. 2009]		
		Proposed Option / Regulation	Dynamic BAT 2020	Implementing Measure		Data base / Correction	LPI	HPI	Technical
				Min.	Max.				
Heat / Fuel savings	TWh					Impact Assessment; Preparatory Study: BAT			
Electricity savings	TWh	23	19.3	18.3	18.3				
GHG emissions reductions	Mio. t CO2eq	14.2	7.4	7.0	7.0				
Energy cost savings	Mio. Euro	2,341			1,867.4				
Net cost savings	Mio. Euro				1,670.4				

LPI: LOW POLICY INTENSITY; HPI: HIGH POLICY INTENSITY; TECHNICAL: TECHNICAL POTENTIAL

MIN. = MINIMUM (MAX. = MAXIMUM) OF POSSIBLE EFFECTS OF AN IMPLEMENTING MEASURE

SOURCE: WUPPERTAL INSTITUTE

Min/Max values are equal, as significant variations in implementation and respective consumer reactions are not to be expected.

ENER11: Pumps

Scope

According to the proposal an electric pump is defined as a pump used for clean water duty of three categories: Single stage end suction water pumps, vertical multistage water pumps and submersible multistage pumps

State of Ecodesign process

Requirements for electric pumps were discussed in Consultation Forum the 29 May 2008.

Ecodesign requirements

One year after the proposed implementing measure comes into force, the C = 10% value will apply for the measurement of energy efficiency of a pump.
Four years after the proposed implementing measure comes into force, the C=40% cut-off values will apply for the measurement of energy efficiency of a pump.

Impacts

Table 38: Quantitative assessment of impact in year 2020 in EU-27 compared to BAU development - Pumps

Impact category	Unit	Estimate by impact assessment / preparatory study	Rough estimate of impacts as expected by Wuppertal Institute (with corrections as explained in Chapter 4.3)				ESD Potential Study [FhG-ISI et al. 2009]		
		Proposed Option / Regulation	Dynamic BAT 2020	Implementing Measure		Data base / Correction	LPI	HPI	Tech-nical
				Min.	Max.				
Heat / Fuel savings	TWh					Preparatory Study			
Electricity savings	TWh	4.7	5.2	2.3	5.2				
GHG emissions reductions	Mio. t CO2eq	1.63	2.0	0.9	2.0				
Energy cost savings	Mio. Euro	478			531.2				
Net cost savings	Mio. Euro								

LPI: LOW POLICY INTENSITY; HPI: HIGH POLICY INTENSITY; TECHNICAL: TECHNICAL POTENTIAL

MIN. = MINIMUM (MAX. = MAXIMUM) OF POSSIBLE EFFECTS OF AN IMPLEMENTING MEASURE

SOURCE: WUPPERTAL INSTITUTE

ENER12: Commercial refrigerators and freezers

Scope

In the scope of Lot 12 (according to the preparatory study) are refrigerated cabinet (remote and plug-in), such as: remote open vertical chilled multi deck, remote open horizontal frozen island, plug-in one door beverage cooler, plug-in horizontal ice-cream freezer and vending machines such as spiral cold vending machines.

State of Ecodesign process

During 2006-2007 the Commission (DG ENER) conducted a preparatory study related to commercial refrigerators and freezers. The finalised preparatory is available. A consultation forum discussing principal options for a regulation took place on 23 April 2010.

Ecodesign requirements

There are no clear proposals stated within the Prep Study with regard to policy instruments that should be implemented.

Impacts

Table 39: Quantitative assessment of impact in year 2020 in EU-27 compared to BAU development - Commercial refrigerators and freezers

Impact category	Unit	Estimate by impact assessment / preparatory study	Rough estimate of impacts as expected by Wuppertal Institute (with corrections as explained in Chapter 4.3)				ESD Potential Study [FhG-ISI et al. 2009]		
		Proposed Option / Regulation	Dynamic BAT 2020	Implementing Measure		Data base / Correction	LPI	HPI	Tech-nical
				Min.	Max.				
Heat / Fuel savings	TWh					Own estimate by Wuppertal Institute based on preparatory study and further data received			
Electricity savings	TWh	26	21.7	12.3	16.6		17.8	18.4	19.9
GHG emissions reductions	Mio. t CO2eq	14.04	8.3	4.7	6.4		6.8	7.1	7.6
Energy cost savings	Mio. Euro	2,647			1,691.5				
Net cost savings	Mio. Euro				1,653.2				

LPI: LOW POLICY INTENSITY; HPI: HIGH POLICY INTENSITY; TECHNICAL: TECHNICAL POTENTIAL

MIN. = MINIMUM (MAX. = MAXIMUM) OF POSSIBLE EFFECTS OF AN IMPLEMENTING MEASURE

SOURCE: WUPPERTAL INSTITUTE

ENER13: Domestic refrigerators and freezers (Regulation entered into force on 12th August 2009)

Scope

The Regulation establishes ecodesign requirements for the placing on the market of electric mains-operated household refrigerating appliances with a storage volume up to 1 500 litres. The Regulation does apply to electric mains-operated household refrigerating appliances, including those sold for non-household use or for the refrigeration of items other than foodstuffs.
It shall also apply to electric mains-operated household refrigerating appliances that can be battery-operated.

State of Ecodesign process

COMMISSION REGULATION (EC) No 643/2009 of 22 July 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for household refrigerating appliances [http://ec.europa.eu/energy/efficiency/ecodesign/legislation_en.htm], published 23. July 2009 in the Official Journal of the European Union L 191/35;
Entry into force: 12. August 2009;
Tiers: First tier: 1 July 2010, Second tier: 1 July 2013;
Revision: Five years after entry into force

Ecodesign requirements

Requirements for compressor-type appliances (95% of the market) are:
From 2010:
The current Class A becomes the new minimum energy performance requirement (EEI>55).
From 2012:
The current Class A+ becomes the new minimum energy performance requirement (EEI>44).
From 2014:
Stricter requirements than the current Class A+ becomes the new minimum energy performance requirement (EEI>42)
(According to benchmarks the best appliances today reach EEI<30).

Impacts

Table 40: Quantitative assessment of impact in year 2020 in EU-27 compared to BAU development - Domestic refrigerators and freezers

Impact category	Unit	Estimate by impact assessment / preparatory study	Rough estimate of impacts as expected by Wuppertal Institute (with corrections as explained in Chapter 4.3)				ESD Potential Study [FhG-ISI et al. 2009]		
		Proposed Option / Regulation	Dynamic BAT 2020	Implementing Measure		Data base / Correction	LPI	HPI	Technical
				Min.	Max.				
Heat / Fuel savings	TWh					Impact Assessment, Preparatory study for BAT			
Electricity savings	TWh	4	7.6	3.6	3.6		5.0	8.7	19.4
GHG emissions reductions	Mio. t CO2eq	3	2.9	1.4	1.4		1.9	3.3	7.4
Energy cost savings	Mio. Euro	203			363.4				
Net cost savings	Mio. Euro				186.3				

LPI: LOW POLICY INTENSITY; HPI: HIGH POLICY INTENSITY; TECHNICAL: TECHNICAL POTENTIAL

MIN. = MINIMUM (MAX. = MAXIMUM) OF POSSIBLE EFFECTS OF AN IMPLEMENTING MEASURE

SOURCE: WUPPERTAL INSTITUTE

Min/Max values are equal, as significant variations in implementation and respective consumer reactions are not to be expected.

ENER14: Domestic washing machines and dishwashers

Scope

This lot covers both dishwashers and washing machines, however only proposals for washing machines have yet been approved by the Regulatory Committee.
The draft Regulation establishes eco-design requirements for the placing of the market of electric mains-operated household washing machines and electric mains-operated household washing machines that can also be powered by batteries, including those sold for non-household use.

State of Ecodesign process

On the 31 March 2009, the Regulatory Committee adopted requirements for washing machines and an updated version of the energy labelling Directive for washing machines.
Draft: COMMISSION REGULATION (EC) No …/.. implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for household washing machines

Ecodesign requirements

Some of the energy efficiency performance requirements are:
From 2010: Minimum requirement of current energy class A (EEI shall be lover than 68) and limit on water consumption for the 60°C full-load programme.
From July 2015: Minimum requirement of the current energy class A+ (EEI shall be lower than 59) for machines of more than 4 kg.

Impacts

Table 41: Quantitative assessment of impact in year 2020 in EU-27 compared to BAU development - Domestic washing machines and dishwashers

Impact category	Unit	Estimate by impact assessment / preparatory study	Rough estimate of impacts as expected by Wuppertal Institute (with corrections as explained in Chapter 4.3)				ESD Potential Study [FhG-ISI et al. 2009]		
		Proposed Option / Regulation	Dynamic BAT 2020	Implementing Measure		Data base / Correction	LPI	HPI	Technical
				Min.	Max.				
Heat / Fuel savings	TWh					Working Document, Preparatory study for BAT			
Electricity savings	TWh	5.96 (washing machines) 12.6 (dishwashers)	15.1	15.1	15.1		2.1	2.5	3.5
GHG emissions reductions	Mio. t CO2eq	9.81 in total	5.8	5.8	5.8		0.8	1.0	1.3
Energy cost savings	Mio. Euro	606 (washing machines 1,283 (dishwashers)			1,533.0				
Net cost savings	Mio. Euro								

LPI: LOW POLICY INTENSITY; HPI: HIGH POLICY INTENSITY; TECHNICAL: TECHNICAL POTENTIAL

MIN. = MINIMUM (MAX. = MAXIMUM) OF POSSIBLE EFFECTS OF AN IMPLEMENTING MEASURE

SOURCE: WUPPERTAL INSTITUTE

Min/Max values are equal, as significant variations in implementation and respective consumer reactions are not to be expected.

ENER15: Solid fuel small combustion installations

Scope

The scope of Lot 15 comprises single combustion appliances and related operating equipment with a capacity below 500 kW. More precisely, the following solid fuel combustions installations are included in the scope: Direct heating domestic appliances, indirect domestic heating appliances and indirect non-domestic heating appliances

State of Ecodesign process

The study on solid fuel small combustion installations was launched in September 2007 and is expected to be completed soon. The final stakeholder meeting was held the 13th July 2009.

Ecodesign requirements

The final task 8 of the preparatory study as well as a working document have not been released yet. Therefore, proposed requirements cannot be stated at this point in time.

Impacts

Table 42: Quantitative assessment of impact in year 2020 in EU-27 compared to BAU development - Solid fuel small combustion installations

Impact category	Unit	Estimate by impact assessment / preparatory study	Rough estimate of impacts as expected by Wuppertal Institute (with corrections as explained in Chapter 4.3)				ESD Potential Study [FhG-ISI et al. 2009]		
		Proposed Option / Regulation	Dynamic BAT 2020	Implementing Measure		Data base / Correction	LPI	HPI	Technical
				Min.	Max.				
Heat / Fuel savings	TWh		26.3	6.1	18.4	Own estimate by Wuppertal Institute based on preparatory study and further data received; main environmental problem is particulate matter, not energy efficiency			
Electricity savings	TWh		0.1	0.0	0.0				
GHG emissions reductions	Mio. t CO2eq		1.5	0.4	1.1				
Energy cost savings	Mio. Euro				2,047.8				
Net cost savings	Mio. Euro				1,873.2				

LPI: LOW POLICY INTENSITY; HPI: HIGH POLICY INTENSITY; TECHNICAL: TECHNICAL POTENTIAL

MIN. = MINIMUM (MAX. = MAXIMUM) OF POSSIBLE EFFECTS OF AN IMPLEMENTING MEASURE

SOURCE: WUPPERTAL INSTITUTE

ENER16: Laundry dryers

Scope

The preparatory study has shown various products that have been identified as referred to under the denomination 'laundry dryers': Commercial dryers (Batch tumbling dryers, washer extractors, drying cabinets, finishing tunnels, flatwork ironing machines) and household dryers (tumble-dryers, washer-dryers, drying cabinets, clotheslines, etc.)

State of Ecodesign process

The final preparatory study is available.

Ecodesign requirements

Different scenarios considers the effects of introducing MEPS as defined in the conservative scenario, updating the energy label combined with subsidies in some Member States, having a moderate impact.

Impact on energy consumption and GHG emissions

The BAT – Ambitious scenario would mean savings of 2 TWh by 2015 to 5 TWh by 2020
The BAT – Ambitious scenario would translate into emission savings of 0.6 mtCO_2eq by 2015 up to 1.6 mtCO_2eq by 2020.

Impacts

Table 43: Quantitative assessment of impact in year 2020 in EU-27 compared to BAU development - Laundry dryers

Impact category	Unit	Estimate by impact assessment / preparatory study	Rough estimate of impacts as expected by Wuppertal Institute (with corrections as explained in Chapter 4.3)				ESD Potential Study [FhG-ISI et al. 2009]		
		Proposed Option / Regulation	Dynamic BAT 2020	Implementing Measure		Data base / Correction	LPI	HPI	Tech-nical
				Min.	Max.				
Heat / Fuel savings	TWh					Preparatory study			
Electricity savings	TWh	1	4.0	0.3	1.3		0.0	0.6	14.9
GHG emissions reductions	Mio. t CO2eq		1.5	0.1	0.5		0.0	0.2	5.7
Energy cost savings	Mio. Euro	101			129.2				
Net cost savings	Mio. Euro								

LPI: LOW POLICY INTENSITY; HPI: HIGH POLICY INTENSITY; TECHNICAL: TECHNICAL POTENTIAL

MIN. = MINIMUM (MAX. = MAXIMUM) OF POSSIBLE EFFECTS OF AN IMPLEMENTING MEASURE

SOURCE: WUPPERTAL INSTITUTE

ENER17: Vacuum cleaners

Scope

Generally, a vacuum cleaner can be defined as: "An electrically operated appliance that removes soiled material (dust, fibre, threads) from the surface to be cleaned by an airflow created by a vacuum developed within the unit by an electrically powered vacuum generator or fan. The material thus removed is separated and stored in the appliance and the cleaned suction air is returned to the ambient.

State of Ecodesign process

The product study on vacuum cleaners started in October 2007 and the final stakeholder meeting was held in January 2009.

Ecodesign requirements

The preparatory study proposed caps for input power ratings of vacuum cleaners. The study is still ongoing

Impacts

Table 44: Quantitative assessment of impact in year 2020 in EU-27 compared to BAU development - Vacuum cleaners

Impact category	Unit	Estimate by impact assessment / preparatory study	Rough estimate of impacts as expected by Wuppertal Institute (with corrections as explained in Chapter 4.3)				ESD Potential Study [FhG-ISI et al. 2009]		
		Proposed Option / Regulation	Dynamic BAT 2020	Implementing Measure		Data base / Correction	LPI	HPI	Tech-nical
				Min.	Max.				
Heat / Fuel savings	TWh					Preparatory study			
Electricity savings	TWh	52.5	43.6	25.1	25.1				
GHG emissions reductions	Mio. t CO2eq	20.16	16.8	9.6	9.6				
Energy cost savings	Mio. Euro	5,344			2,557.5				
Net cost savings	Mio. Euro								

LPI: LOW POLICY INTENSITY; HPI: HIGH POLICY INTENSITY; TECHNICAL: TECHNICAL POTENTIAL

MIN. = MINIMUM (MAX. = MAXIMUM) OF POSSIBLE EFFECTS OF AN IMPLEMENTING MEASURE

SOURCE: WUPPERTAL INSTITUTE

Min/Max values are the same, because it is not expected that there could be significant variations in implementation and respective consumer reactions.

ENER18: Complex set-top boxes

Scope

This product group covers digital convertors for TVs, including additional features such as pay-TV and network connectivity.

State of Ecodesign process

In the proposal, the Commission suggests a voluntary agreement
Industry representatives have presented a draft voluntary agreement that is expected to be signed by a large number of companies
The targets for Tier 1 of the agreement are proposed to become effective the 1 July 2010 and targets for Tier 2, the 1 July 2013.
Consultation Forum was held the 12 October 2009.

Ecodesign requirements

The voluntary agreement proposed requirements for two tiers.
Tier 1: Annual Energy Allowances: 40-45 kWh/year depending on functionality
Tier 2: Annual Energy Allowances: 35-40 kWh/year depending on functionality

Impacts

Table 45: Quantitative assessment of impact in year 2020 in EU-27 compared to BAU development - Complex set-top boxes

Impact category	Unit	Estimate by impact assessment / preparatory study	Rough estimate of impacts as expected by Wuppertal Institute (with corrections as explained in Chapter 4.3)				ESD Potential Study [FhG-ISI et al. 2009]		
		Proposed Option / Regulation	Dynamic BAT 2020	Implementing Measure		Data base / Correction	LPI	HPI	Tech-nical
				Min.	Max.				
Heat / Fuel savings	TWh		0.0	0.0	0.0	Preparatory study			
Electricity savings	TWh	5.6	4.6	2.6	4.6		0.8	0.8	1.0
GHG emissions reductions	Mio. t CO2eq	2.36	1.8	1.0	1.8		0.3	0.3	0.4
Energy cost savings	Mio. Euro	570			467.7				
Net cost savings	Mio. Euro								

LPI: LOW POLICY INTENSITY; HPI: HIGH POLICY INTENSITY; TECHNICAL: TECHNICAL POTENTIAL

MIN. = MINIMUM (MAX. = MAXIMUM) OF POSSIBLE EFFECTS OF AN IMPLEMENTING MEASURE

SOURCE: WUPPERTAL INSTITUTE

ENER19: Non-directional household lamps (Regulation entered into force on 19th September 2009)

Scope

The Regulation establishes ecodesign requirements for the placing on the market of non-directional household lamps, including when they are marketed for non-household use or when they are integrated into other products. It also establishes product information requirements for special purpose lamps.

State of Ecodesign process

COMMISSION REGULATION (EC) No 244/2009 of 18 March 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for non-directional household lamps [http://ec.europa.eu/energy/efficiency/ecodesign/legislation_en.htm], published 24. March 2009 in the Official Journal of the European Union L 76/3;
Entry into force: 13. May 2010;
Tiers: Stage 1: 1 September 2009, Stage 2: 1 September 2010, Stage 3: 1 September 2011, Stage 4: 1 September 2012, Stage 5: 1 September 2013, Stage 6: 1 September 2016;
Revision: Five years after entry into force

On the 19 Sept 2009 an amendment on the UV radiations of lamps entered into force, with retroactive effect from 1 Sept 2009.

Ecodesign requirements

Some of the requirements are:
Sept 2009: Frosted and clear 100 watt incandescent bulbs are not allowed.
Sept 2010: Clear 75 watt incandescent bulbs are not allowed.
Sept 2011: Clear 60 watt incandescent bulbs are not allowed.
Sept 2012: Clear 40 and 25 watt incandescent bulbs are not allowed.
Sept 2013: Stricter requirements for compact fluorescent lamps and LED lamps.
Sept 2016: Stricter requirements for halogen lamps.

Impacts

Table 46: Quantitative assessment of impact in year 2020 in EU-27 compared to BAU development - Non-directional household lamps

Impact category	Unit	Estimate by impact assessment / preparatory study	Rough estimate of impacts as expected by Wuppertal Institute (with corrections as explained in Chapter 4.3)				ESD Potential Study [FhG-ISI et al. 2009]		
		Proposed Option / Regulation	Dynamic BAT 2020	Implementing Measure		Data base / Correction	LPI	HPI	Tech-nical
				Min.	Max.				
Heat / Fuel savings	TWh		0.0	0.0	0.0	Impact Assessment; Preparatory study for BAT			
Electricity savings	TWh	39	56.8	25.3	31.7		0.8	0.8	1.0
GHG emissions reductions	Mio. t CO2eq	13.53	21.8	9.7	12.2		0.3	0.3	0.4
Energy cost savings	Mio. Euro	3,970			3,222.9				
Net cost savings	Mio. Euro				3,010.8				

LPI: LOW POLICY INTENSITY; HPI: HIGH POLICY INTENSITY; TECHNICAL: TECHNICAL POTENTIAL

MIN. = MINIMUM (MAX. = MAXIMUM) OF POSSIBLE EFFECTS OF AN IMPLEMENTING MEASURE

SOURCE: WUPPERTAL INSTITUTE

Different possible consumer reactions considered: Consumers can switch from incandascent light bulbs to either compact fluorescent lamps, energy-efficient halogen lamps or light emitting diodes (LED). It is not clear yet what will the market share of which of these technologies in the year 2020. Therefore, this range of possible consumer reactions has been estimated.

ENER19: Directional light sources

Scope

Relating to the preparatory study the main relevant domestic lamp types are: GLS lamps, halogen lamps, linear fluorescent and compact fluorescent lamps. New lamp types like LED and metal halide are relevant as new technologies.

State of Ecodesign process

Finalized preparatory study. Consultation Forum is not yet decided.

Ecodesign requirements

The preparatory study shows different scenarios to reduce the electricity, mercury and CO_2 emissions from 2010 to 2020

Impact on energy consumption and GHG emissions

The total electricity consumption in 2007 of directional lighting sources which are in the scope of this study and used in all sectors is about 24.785 TWh. This represents about 0.88% of the EU-27 total electricity consumption
More than 40% reduction in electricity consumption in BAT scenario compared to BAU for period 2010 to 2020

Impacts

Table 47: Quantitative assessment of impact in year 2020 in EU-27 compared to BAU development - Directional light sources

Impact category	Unit	Estimate by impact assessment / preparatory study	Rough estimate of impacts as expected by Wuppertal Institute (with corrections as explained in Chapter 4.3)				ESD Potential Study [FhG-ISI et al. 2009]		
		Proposed Option / Regulation	Dynamic BAT 2020	Implementing Measure		Data base / Correction	LPI	HPI	Tech-nical
				Min.	Max.				
Heat / Fuel savings	TWh		0.0	0.0	0.0	Preparatory study			
Electricity savings	TWh	24.81	81.5	78.9	81.5		0.8	0.8	1.0
GHG emissions reductions	Mio. t CO2eq	12.88	31.3	30.3	31.3		0.3	0.3	0.4
Energy cost savings	Mio. Euro	2,526			8,301.5				
Net cost savings	Mio. Euro								

LPI: LOW POLICY INTENSITY; HPI: HIGH POLICY INTENSITY; TECHNICAL: TECHNICAL POTENTIAL

MIN. = MINIMUM (MAX. = MAXIMUM) OF POSSIBLE EFFECTS OF AN IMPLEMENTING MEASURE

SOURCE: WUPPERTAL INSTITUTE

Products of the working programme 2009-2011

Scope

The product groups of the working programme 2009-2011 are listed in the following Table 48.

Table 48: Product groups and respective examples in the context of the first working programme 2009-2011

Product group	Scope/Product examples
ENER 20 Local room heating products	Local room heating products
ENER 21 Central heating products	According to the website of the European Commission Central heating products using hot air to distribute (other than CHP)
ENER 22 Domestic and commercial ovens	According to the Preparatory Study (draft) Commercial and domestic ovens (including when incorporated in cookers) using electricity (including microwaves) and gas, whose main purpose is to heat, bake, dry or roast food; Appliances within the scope are for example range ovens, microwave ovens, toasters, halogen ovens, roaster ovens, steam ovens, dehydrators
ENER 23 Domestic and commercial hobs and grills	According to the Preparatory Study (draft) Domestic and commercial hobs and grills, including when incorporated in cookers. Appliances within the scope are for example: gas and electric hobs, range cookers, induction hobs, gas grills, charcoal grill
ENER 24 Professional wet appliances and dryers	According to the website of the European Commission Professional washing machines, dryers and dishwashers
ENER 25 Non-tertiary coffee machines	According to the Preparatory Study (draft) Coffee machines used in households and offices. Within the scope are drip/filter coffee machines, pod filter coffee machines, espresso machines, electric percolator, electric moka pot, electric vacuum coffee machines and traditional coffee machines
ENER 26 Networked standby losses	According to the Preparatory Study (draft) Networked standby mode means a condition during which the equipment is directly or indirectly connected to the mains power source and provides the following functions: reactivation via network, network integrity communication, reactivation, information and status display. Equipment within the scope are household, information technology, consumer and toys, leisure and sports equipment
ENER 27 Domestic uninterruptible power supplies (UPS)	Domestic uninterruptible power supplies
ENTR 1 Refrigerating and freezing equipment	According to the preparatory study (draft) Commercial refrigeration equipment not covered by ENER Lot 12 will be covered: service cabinets, walk-in cold rooms, chillers, ice-makers dessert and beverage machines, minibars, blast cabinets, water dispensers, wine storage cabinets
ENTR 2 Distribution and power transformers	According to the preparatory study (draft) Transformers were defined for use in the electrical transmission and distribution systems. The proposed product categories of the preparatory study are MV/VL Distribution transformers, Line voltage restorers, DER LV/MV transformers, Industry MV/LV oil transformer, Industry MV/LV dry transformer, Power transformer, Phase, Separation/isolation transformer, Control transformer, Safety transformer, Speciality transformer, Magnetic halogen transformer
ENTR 3 Sound and imaging equipment	According to the preparatory study (draft) Three product types have been investigated covering video players/ recorders, video projectors, and video games consoles
ENTR 4 Industrial ovens	According to the working plan 2009-2011 (COM(2008)660 final) Infrared radiation ovens; Resistance-heated and electrical induction industrial and laboratory furnaces and ovens; furnace burners.
ENTR 5 Machine tools	According to the Concept Description for CECIMO's Self-Regulatory Initiative (SRI) The concept has been developed and proven by milling and turning machine tools intended for metal works.
ENTR 6 Tertiary air conditioning	According to the first stakeholder information request Air-conditioning in cooling mode and non-residential & collective residential ventilation, e.g. dedicated ventilation exhaust air handling units and Package, split and multi split air conditioner [air-to-air > 12 kW, water-to-air, evaporatively cooled
ENTR ## Medical imaging equipment	According to the Self- Regulatory Committee Medical imaging equipment for human applications: Computer Tomography (CT), Ultrasound8, X-Ray, Magnetic Resonance Imaging (MRI), Nuclear Medicine
ENV 1 Water using products	Water using products

State of ecodesign process

For some of the product groups of the first working plan (ENER 20 - ENER 21, ENV 1) no documents have been available yet, for others (ENER 22 - ENER 27, ENTR 1 - ENTR 2, ENTR 4 and ENTR 6), only first drafts of single tasks of the preparatory studies have been published yet. For the other product groups the preparatory studies are still ongoing and no document was finalised yet.

Ecodesign requirements

No requirements have been published or discussed yet.

Impact

No preparatory study was finalized yet. That is why clear data for the different product groups cannot be mentioned by now. The study for preparing the first Working Plan of the EcoDesign Directive (EPTA et al. 2007) and the Working plan for 2009-2011 under the Ecodesign Directive (COM(2008) 660 final) as well as further studies present first indications and estimations for the energy and GHG consumption of different product groups. However, the product categories of EPTA et al. 2007 do not always fit with the different lots. Nevertheless, the following tables show some results.

Table 49: Product groups, environmental impacts and improvement potentials of the products of the first working programme 2009-2011

Product group	Product examples	Significant environmental impact	Significant potential for improvement
Air-conditioning and ventilation systems	Large air conditioners > 12 kW; Water-cooled air conditioners; Ventilation systems	High energy consumption (> 1 000 PJ/year), with long operating time	High potential for energy savings (estimated average > 20%)
Electric and fossilfuelled heating equipment	Electric storage heating radiators; Electric heaters for space and soil heating; Gas- and oil-fired dry space heating systems; Heat pumps	High energy consumption (> 1 000 PJ/year)	High potential for energy savings (estimated average > 20%)
Food-preparing equipment	Electric, gas-fired and microwave ovens; Hobs and grills; Coffee machines	High energy consumption (> 1 000 PJ/year), with long operating time in the tertiary sector	High potential for energy savings (estimated 10-30%)
Industrial and laboratory furnaces and ovens	Infra-red radiation ovens; Resistance-heated and electrical induction industrial and laboratory furnaces and ovens; Furnace burners	High energy consumption (> 1 000 PJ/year), with long operating time	High potential for energy savings (estimated average > 20%)
Machine tools	Forming machine tools; Separating machine tools; Physico-chemical process machine tools	High energy consumption (> 1 000 PJ/year), with long to very long operating time	High potential for energy savings (low power factor of 0.7-0.8, improvement potential in idle modus and by variable speed drives)
Refrigerating and Freezing equipment	Service cabinets; Walk-in cold rooms; Chillers; Ice-makers; Ice-cream and milkshake machines	High energy consumption (> 1 000 PJ/year), with very long operating time	High potential for energy savings (estimated 10-60%)
Sound and imaging equipment	DVD/video players and recorders; Video projectors; Video game consoles; Digital amplifiers and subwoofers for home theatre	High energy consumption (> 1 000 PJ/year)	High potential for energy savings (estimated average > 20%)
Transformers	Distribution transformers; Power transformers; Small transformers	High energy consumption (> 1 000 PJ/year)	High potential for energy savings (about 30% possible)

SOURCE: EPTA ET AL. 2007

The following Table 50 gives some very preliminary rough estimates for these product groups.

Table 50: Quantitative assessment of impact in year 2020 in EU-27 compared to BAU development - Product groups of the first working plan 2009-2011

Impact category	Unit	Rough estimate of impacts as expected by Wuppertal Institute (with corrections as explained in Chapter 4.3)			Remarks
		Dynamic BAT 2020	Implementing Measure		
			min	max	
ENER 20-22: Local room heating products; central heating products, domestic and commercial ovens					Rough own calculation with TREN 20-22 energy as remaining energy for heating purposes after deduction of Lot 1/2 and Lot 15
Heat / Fuel savings	TWh	181.8	49.1	89.5	
Electricity savings	TWh	12.1	6.6	12.1	
GHG emissions reductions	Mio. t CO2eq	15.1	5.4	9.8	
Energy cost savings	Mio. Euro			11,168.7	
ENER 23: Domestic and commercial hobs and grills					Rough own calculation based on EPTA et al. 2007
Electricity savings	TWh	8.0	2.7	8.0	
GHG emissions reductions	Mio. t CO2eq	3.1	1.0	3.1	
Energy cost savings	Mio. Euro			812.8	
ENER 24: Professional wet appliances and dryers					Rough own calculation based on preparatory study
Electricity savings	TWh	1.2	0.1	0.4	
GHG emissions reductions	Mio. t CO2eq	0.4	0.0	0.1	
Energy cost savings	Mio. Euro			37.8	
ENER 25: Non-tertiary coffee machines					Rough own calculation based on preparatory study
Electricity savings	TWh	2.6	0.9	2.6	
GHG emissions reductions	Mio. t CO2eq	1.0	0.3	1.0	
Energy cost savings	Mio. Euro			269.0	
ENER 26: Networked standby losses					Rough own calculation based on preparatory study
Electricity savings	TWh	3.1	3.1	3.1	
GHG emissions reductions	Mio. t CO2eq	1.2	1.2	1.2	
Energy cost savings	Mio. Euro			314.6	
ENTR 1: Refrigerating and freezing equipment					Rough own calculation based on EPTA et al. 2007
Electricity savings	TWh	20.7	15.3	15.3	
GHG emissions reductions	Mio. t CO2eq	7.9	5.9	5.9	
Energy cost savings	Mio. Euro			1,559.5	
ENTR 2: Transformers					Rough own calculation based on preparatory study and SEEDT study
Electricity savings	TWh	10.9	3.6	6.8	
GHG emissions reductions	Mio. t CO2eq	4.2	1.4	2.6	
Energy cost savings	Mio. Euro			695.3	
ENTR 3: Sound and imaging equipment					Rough own calculation based on preparatory study and further information received from preparatory study contractors
Electricity savings	TWh	8.3	8.3	8.3	
GHG emissions reductions	Mio. t CO2eq	3.2	3.2	3.2	
Energy cost savings	Mio. Euro			845.0	
ENTR 4: Industrial ovens					Rough own calculation based on EPTA et al. 2007
Electricity savings	TWh	2.1	0.4	1.0	
GHG emissions reductions	Mio. t CO2eq	0.8	0.2	0.4	
Energy cost savings	Mio. Euro			135.7	
ENTR 5: Machine tools					Rough own calculation based on EPTA et al. 2007
Electricity savings	TWh	37.5	15.0	22.5	
GHG emissions reductions	Mio. t CO2eq	14.4	5.8	8.6	
Energy cost savings	Mio. Euro			2,288.5	

Impact category	Unit	Rough estimate of impacts as expected by Wuppertal Institute (with corrections as explained in Chapter 4.3)			Remarks
		Static BAT based on pep. study	Implementing Measure		
			min	Max	
ENTR 6: Tertiary air conditioning					Rough own calculation based on preparatory study: Stakeholder information request
Electricity savings	TWh	48.7	8.7	20.2	
GHG emissions reductions	Mio. t CO2eq	18.7	3.3	7.8	
Energy cost savings	Mio. Euro			2,058.3	
Medical imaging equipment					Rough own estimate based on proposed self-regulatory initiative
Electricity savings	TWh	0.0	0.0	0.0	
GHG emissions reductions	Mio. t CO2eq	0.0	0.0	0.0	
Energy cost savings	Mio. Euro			1.8	

MIN. = MINIMUM (MAX. = MAXIMUM) OF POSSIBLE EFFECTS OF AN IMPLEMENTING MEASURE

SOURCE: WUPPERTAL INSTITUTE BASED ON DATA FROM DIFFERENT STUDIES AND EXPERT VIEWS

4.11 Products for which voluntary agreements are proposed by industry

Products, for which voluntary or negotiated agreements (self-regulatory initiatives) have been considered or are currently discussed are are the following:

- ENER 4 - Imaging equipment
- ENER 18 - Complex set-top boxes
- Machine tools
- Medical imaging equipment.

With regard to the machine tools, due to not-existing data bases for the definition of energy efficiency requirements, a continuous improvement process has been proposed by the manufacturers' association. For the other product groups, specific MEPS values have been proposed.

It is not possible to calculate in detail, if a voluntary agreement comes to the same results as a regulation. In general, voluntary agreements with manufacturers of energy-using appliances and installations can be an alternative to legally binding standards under specific circumstances. All kinds of voluntary or negotiated agreements have in common that they are based on the solidarity of participants, thus leading to new forms of communication and co-operation in the sectors concerned. Their ecological effectiveness depends on the agreement on and the realisation of concrete and ambitious reduction targets, accurate and independent evaluation procedures and effective penalties in case of non-compliance with the targets.

Typical circumstances in which to apply this instrument:

- When dealing with a small number of actors with which you need to negotiate or a strongly organised sector
- When there is much relatively cheap saving potential (low hanging fruit).

Factors to be considered for the success of self-regulatory initiatives:

- Is the target group motivated to participate in the voluntary agreement?
- Is the target set beyond business-as-usual?
- Are there penalties in case of non-compliance (or are there other incentives in place to prevent non-compliance, e.g. a rebate on energy tax, or is there a regulatory threat in case of non-compliance)?
- Is there a good monitoring system in place?